



Five-Year Review Report

Superfund Records CenterSITE: L&RRRELEASE: 8.3Third Five-Year Review OTHER: 457538

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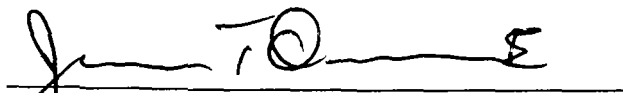
Landfill and Resource Recovery (L&RR) Superfund Site

North Smithfield, Rhode Island

September 2009

Prepared by:

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9/2/09
Date

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ACRONYMS

1,2-DCA	1,2-Dichloroethane
AAL	Acceptable Air Level
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
COC	Contaminant of Concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
GPC	Groundwater Protection Criteria
gpm	gallons per minute
HDPE	high density polyethylene
ICs	institutional controls
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
POC	Point of Compliance
ppb	parts per billion
PPL	Priority Pollutant List
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RIDEM	Rhode Island Department of Environmental Management
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TCE	Trichloroethene
TCL	Target Compound List
µg/L	micrograms per liter
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

This is the third Five-Year Review for the Landfill & Resource Recovery Superfund Site (Site) located in the North Smithfield, Rhode Island. The review was conducted in accordance with EPA Office of Solid Waste and Emergency Response Guidance No. 9355.7-03B-P. This statutory Five-Year Review is required because hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory review is the last Five-Year Review for this Site, which was completed on September 28, 2004.

The Site is a 28-acre closed landfill located in North Smithfield, Providence County, Rhode Island. The landfill is part of a 36-acre parcel owned by Landfill & Resource Recovery, Inc. (L&RR), which is located in an undeveloped area and is primarily surrounded by woodlands. Groundwater from the Site generally flows in east-northeasterly direction.

The remedy selected in the September 29, 1988 Record of Decision (ROD) Site included: upgrading the landfill closure, installing a gas collection and thermal destruction system, remediation of two wetland areas, and periodic monitoring of groundwater and air for a period of thirty years. A requirement to implement institutional controls for land and water use restrictions to protect public health and the environment, and to protect the remedy, was memorialized in 1997 in a consent decree.

Construction of the remedy was completed in accordance with the ROD. Operation and maintenance of the cap and drainage structures have been effective. A gas collection and treatment system (enclosed flare) has been in place to reduce landfill gas emission to ambient air and gas migration. Ambient Air Levels (AALs) promulgated under Rhode Island Air Toxics Regulations were selected as the target cleanup levels for gaseous emissions from the Site.

Diminishing landfill gas generation and associated mechanical problems with the enclosed flare unit led to its discontinuation in January 2007, and cessation of active gas collection and treatment at that time. Rather, the gas collection system was outfitted with four fluidic (candlestick) flares as an interim measure to treat gas collected via passive pressures. In Spring 2009, the gas collection and enclosed flare system was repaired and a study conducted to consider alternatives to optimize the collection and treatment of the landfill gas. In July 2009,

the fluidic flares were closed in preparation for the restart of the enclosed flare, which was reactivated for an on-going test run on July 27, 2009.

Currently, the groundwater sampling in one downgradient monitoring well (MW-102A) continues to show contaminant concentrations in exceedance of the applicable MCLs of several volatile organic compounds of concern (VOCs) and suggests contamination extends somewhat beyond the landfill footprint. Although the full extent of the groundwater contamination has not been completely delineated, the VOC concentrations in the groundwater monitoring wells at the footprint of the landfill have been steadily declining over the last five years. The absence of contamination in MW-202, located between Pound Hill Road and the wetlands and streams east of the Site, shows that contamination has not migrated to that point east of the landfill.

The five-year review identifies two issues that call into question the current and future protectiveness of the remedy. First, performance testing and modeling of the restarted enclosed flare and active landfill gas collection system needs to be conducted to confirm compliance with performance standards. Second, institutional controls are required on a number of parcels to generally restrict the use of groundwater and surface water, prohibit disturbance of the cap, and prohibit use of the property in any way that would disturb remedial measures taken. It is anticipated that these Institutional Controls, which are necessary to ensure future protectiveness, will be finalized within the next 15 months.

In light of the expectation that the reactivation of the enclosed flare and gas collection system will be addressed in the near future, a protectiveness determination will be deferred in accordance with the guidance until the enclosed flare and active landfill gas collection system are restarted and performance testing and modeling are conducted to confirm compliance with performance standards.

FIVE-YEAR REVIEW SUMMARY FORM

FIVE-YEAR REVIEW SUMMARY FORM			
SITE IDENTIFICATION			
Site name (from WasteLAN): Landfill and Resource Recovery (L&RR) Superfund Site			
EPA ID (from WasteLAN): RID093212439			
Region: 1	State: RI	City/County: North Smithfield / Providence	
SITE STATUS			
NPL Status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (Specify)			
Remediation Status (choose all that apply): <input type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Operating <input type="checkbox"/> Complete			
Multiple OUs? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Construction completion date: 02/24/1997	
Has site been put into reuse? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			
REVIEW STATUS			
Lead agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency:			
Author name: Anna Krasko			
Author title: Remedial Project Manager		Author Affiliation: U.S. Environmental Protection Agency	
Review period: January 15, 2009 – September 2009			
Date(s) of site inspection: 04/29/2009			
Type of review: <input checked="" type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion			
Review number <input type="checkbox"/> 1 (first) <input type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)			
Triggering action <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> Actual RA Onsite Construction at OU # <input type="checkbox"/> Construction Completion <input type="checkbox"/> Other (specify) </div> <div> <input type="checkbox"/> Actual RA Start at OU# <input checked="" type="checkbox"/> Previous Five-Year Review Report </div> </div>			
Triggering action date (from WasteLAN): September 28, 2004			
Due date (five years after triggering action date): September 28, 2009			

Five-Year Review Summary Form, Cont'd

Issues:

1. The interim four fluidic flares and passive landfill gas collection system are not adequately controlling landfill gas migration at the Site.
2. Several contaminants are present in groundwater beyond the landfill boundary at concentrations above MCLs,
3. Required Institutional Controls have not been implemented.

Recommendations and Follow-up Actions:

1. Restart the enclosed flare and active landfill gas collection system and conduct performance testing and modeling to confirm compliance with performance standards.
2. Continue monitoring the existing well network and continue to evaluate declining trends in groundwater VOCs concentrations and the need for additional plume delineation and monitor effectiveness of the existing landfill closure.
3. Finalize Land Usage Restrictions and record ICs on affected properties; and memorialize the ICs requirement in a decision document.

Protectiveness Statement(s):

A protectiveness determination of the remedy at the L&RR Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by restarting the enclosed flare and active landfill gas collection system and conducting performance testing and modeling to confirm compliance with performance standards. It is expected that these actions will take approximately 15 months to complete, at which time a protectiveness determination will be made.

Other Comments: None.

1.0 INTRODUCTION

The purpose of this Five-Year Review is to determine whether the remedy being implemented at the Landfill & Resource Recovery Superfund Site (Site) remains protective of human health and the environment. The methods, findings, and conclusions of the Five-Year Review are documented in this Third Five-Year Review Report. In addition, this report presents issues identified during the review and provides recommendations to address them.

This report was prepared pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA § 121(c) states:

“If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that the action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews and any actions taken as a result of such reviews.”

The Agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR § 300.430 (f)(4)(ii) states:

“If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action. “

This is the third Five-Year Review for the Site. The Five-Year Review is required because contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory review is the last Five-Year Review for this Site, which was completed on September 28, 2004.

2.0 SITE CHRONOLOGY

Table 1
Chronology of Site Events
Landfill & Resource Recovery Superfund Site
North Smithfield, Rhode Island

Date	Event
November 1977	Landfill & Resource Recovery, Inc., (L&RR) submitted plans for installation of seven monitoring wells to the Rhode Island Department of Health
September 1979	The Rhode Island Department of Environmental Management ordered L&RR to stop accepting hazardous wastes for disposal
September 8, 1983	Final listing on EPA National Priorities List
1985	Landfill closure began
June 1988	Completion of Remedial Investigation/Feasibility Study
September 29, 1988	Record of Decision is signed
June 29, 1990	Unilateral Administrative Order (UAO) issued by EPA
October 14, 1990	The Statement of Work attached to the UAO was modified
March 8, 1991	First Explanation of Significant Differences issued for the Site
March 1993	Remedial Design start
September 1994	Remedial Design completion
May 1994	RA construction activities began at the Site
February 1995	RA construction completed
September 1996	Post Closure Operation and Maintenance Plan approved by EPA
September 16, 1996	A second Explanation of Significant Differences issued for the Site
February 18, 1997	Settlement Agreement and Consent Decree lodged in U.S. District Court
February 24, 1997	Preliminary Close Out Report issued by EPA
March 25, 1997	Final As-Built Drawing submitted for EPA review and approval
September 4, 1997	Remedial Action report issued by EPA
September 1999	First Five-Year Review report issued by EPA for the Site
September 28, 2004	Second Five-Year Review report issued by EPA for the Site.
January 2007	Shut down of the enclosed flare and condensate injection system due to mechanical failures.
Spring 2007	Groundwater monitoring frequency was changed from semi-annual to annual.
April 2007	Approval by EPA and RIDEM for the installation of four interim fluidic (candlestick) flares as a stop-gap measure until the enclosed flare system could be repaired.
November 2008	Settling Defendants install 45 temporary gas monitoring probes to monitor off-site landfill gas migration.
March 9, 2009	Settling Defendants submit Alternatives Investigation Report for potential solutions for soil gas migration.
July 2009	Reactivation of the enclosed flare and active gas collection system

3.0 BACKGROUND

3.1 Location, Physical Characteristics and Access

The Site is a 28-acre closed landfill located in North Smithfield, Providence County, Rhode Island. The landfill is part of a 36-acre parcel owned by Landfill & Resource Recovery, Inc. (L&RR), which is located on Oxford Turnpike (also called Old Forge Road) northwest of its intersection with Pound Hill Road. Access to the Site is by way of an unpaved road that connects Douglas Pike (Route 7) to Oxford Turnpike just north of the Site. A map depicting the location of the Site is presented as Figure 1 (Attachment 1).

The Site is located in an undeveloped area and is primarily surrounded by woodlands. The landfill extends to Oxford Turnpike to the west and southwest; to a wetland and intermittent stream to the southeast; and to the property line or onto the adjacent power line property to the north and east (see Figure 2, provided in Attachment 1 of this report). Groundwater from the Site generally flows in east-northeasterly direction, toward the Trout Brook. Three unnamed streams are located to the south and east of the Site. These streams flow through wetland areas and then discharge to Trout Brook. Trout Brook flows into Trout Brook Pond which then discharges to the lower Slatersville Reservoir. Trout Brook and the Slatersville Reservoir are designated as Class B water bodies by RIDEM, which indicates that they are suitable for fishing, swimming, and other recreational activities (USEPA, 1988).

3.2 Land and Resource Use

The landfill is located over the Slatersville Aquifer, which has been designated as a drinking water source by the State of Rhode Island (USEPA, 1988). The Tifft Road well, a public water supply well operated by the North Smithfield Water Authority, is located just north of Tifft Road and just west of Trout Brook Pond. In the past, the water authority has been considering replacement of the Tifft Road well. If this were to occur, the replacement well may be designed to pump at a higher rate (200 gallons per minute (gpm)) than the existing well, which operates at a rate of 100 gpm. A groundwater flow model developed by USGS and reviewed by EPA showed that these potential increased water withdrawal did not capture groundwater from L&RR and did not substantially change the direction of groundwater flow downgradient of the landfill. Residences on most other streets around the Site, including Pound Hill Road, Black Plain Road, rely on private wells for water supply. The closest residence to the Site is approximately 1,200 feet southeast of the landfill, on Pound Hill Road.

3.3 History of Contamination

The landfill is a former sand and gravel pit which reportedly began accepting municipal wastes for disposal around 1927. During its years of operation, the landfill also accepted commercial and industrial wastes for disposal. In 1974, the landfill and surrounding land was sold to L&RR, the current owner of the Site. EPA has estimated that more than two million gallons of hazardous chemicals including solvents, plating waste, asbestos, oils, and dyes were brought to the landfill for disposal (de maximis, 1997).

3.4 Initial Response

The first indication that disposal of hazardous waste was occurring at the Site was in November 1977, when L&RR submitted plans to the Rhode Island Department of Health for installation of seven monitoring wells to comply with State regulations pertaining to hazardous waste disposal. In September 1979, Rhode Island Department of Environmental Management (RIDEM) ordered L&RR to stop accepting hazardous wastes for disposal. In December 1979, L&RR placed a synthetic cover over a portion of the landfill (an area it claimed contained hazardous waste). Several monitoring wells were installed and sampled between 1977 and 1980.

EPA conducted a Preliminary Site Assessment in 1980 and 1981, which resulted in the Site being placed on the National Priorities List (NPL). The Site received final listing on the NPL in September 1983.

The landfill stopped accepting waste in January 1985. Landfill closure began in 1985 pursuant to a 1983 Court Order and Consent Order and Agreement between RIDEM and L&RR. In 1986, under the direction of RIDEM, L&RR covered a majority of the landfill with a 20-mil polyvinyl chloride geomembrane and soil, and installed a system of 18 gas vents.

EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) in 1986. The RI/FS was completed in June 1988 (Ebasco, 1988).

3.5 Basis for Taking Action

A baseline human health risk assessment performed as part of the RI/FS (Ebasco, 1988) concluded that although exposures to surface water and sediments adjacent to the Site or groundwater at the boundary of the Site did not pose a significant risk to human health, potential

exposure to gaseous emissions from the landfill posed a significant health risk to neighboring residents and children who may play on the landfill.

The baseline environmental risk assessment concluded that while there were no risks to wildlife at the Site from exposure to Contaminants of Concern (COCs), erosion of the landfill cover and filling in nearby wetlands was destroying vegetation and decreasing the ability of the wetland areas to support indigenous plant and animal life.

The following summarizes the contaminants detected in various media at the Site, as identified in the 1988 RI:

Air. Hydrogen sulfide, volatile organic compounds (VOCs), and methane were detected in gas samples collected from the 18 vents on the landfill. Five of the vents, located within the approximate area where hazardous wastes were purportedly disposed, contained much higher levels of VOCs. Methane, hydrogen sulfide, and several VOCs were also detected in fugitive emissions from the surface of the uncovered area of the landfill.

Groundwater. Low levels of VOCs and metals (arsenic, cadmium, and lead) were detected in groundwater downgradient of the Site. All concentrations were below Safe Drinking Water Act Maximum Contaminant Levels (MCLs). In addition, iron, manganese, chloride, and specific conductance were detected in downgradient groundwater at slightly elevated levels that are typically found in groundwater migrating from municipal landfills. COCs in groundwater included 2-butanone (methyl ethyl ketone), arsenic, and lead.

Subsurface Soil. No significant levels of contaminants were identified in subsurface soils in the RI.

Sediment and Surface Water. Low levels of VOCs and inorganic compounds were detected in surface water and sediments from nearby streams. COCs in surface water and/or sediments included 2-butanone, toluene, trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethane (1,1-DCA), arsenic, lead, and zinc.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

The Record of Decision (ROD) was signed on September 29, 1988. The remedial action objectives stated in the ROD¹ as modified by the two ESDs are:

- Remediate the landfill so that federal and state applicable, or relevant, and appropriate requirements are met and to insure that the landfill is protective of human health and the environment;
- Remediate the landfill gas so that VOC concentrations in ambient air are reduced and risks to public health and the environment are minimized.

The selected remedy consisted of the following components:

1. **Upgrading the Landfill Closure.** This component included installing a fence; developing a post-closure monitoring plan; upgrading the surface water runoff management system; stabilizing the steep side slopes and installing a synthetic cover over the uncovered northeast area of the landfill; establishing a soil cover thickness of 24 inches; and establishing vegetation.
2. **Gas Collection and Thermal Destruction.** This component involved collecting gas from the existing 18 vents and installing a subsurface piping system to direct gaseous emissions to a thermal treatment system. Three alternative thermal destruction technologies (combustion, flaring, and incineration) were identified as potential treatment options for the gaseous emissions.
3. **Wetlands Remediation.** This component involved excavating sands from two wetlands areas impacted by sedimentation and subsequent restoration of the excavated areas.

¹ In addition to the two objectives listed here, the ROD contained two remedial action objectives concerning impact to and restoration of adjacent wetlands. These objectives are no longer applicable due to a modification in the remedy set forth in the 1991 Explanation of Significant Differences and discussed in greater detail in the text.

4. **Site Monitoring.** This component involved periodic monitoring of groundwater and air for a period of thirty years. Groundwater monitoring was to be conducted quarterly while the air monitoring program would be outlined during the design phase.

Two Explanation of Significant Differences (ESDs) have been issued for the L&RR Site. The first ESD, signed on March 8, 1991, stated that EPA had re-evaluated information for the Site and determined that the wetlands remediation required by the 1988 ROD would be more properly addressed through the Federal Clean Water Act, or other federal or state statutes or regulations.

The second ESD, signed on September 16, 1996, was issued to clarify that the groundwater standards referenced in the ROD (i.e., Safe Drinking Water Act MCLs) are to be used to evaluate and monitor the integrity and performance of the landfill closure and are not, by themselves, cleanup or performance standards for groundwater.

In addition, a requirement that institutional controls for land and water use restrictions to protect public health and the environment, and to protect the remedy, was memorialized in the 1997 Settlement Agreement and Consent Decree (CD). Accordingly, the CD requires placement of environmental easements on the Site properties. Additionally, the CD requires long-term monitoring of surface water.

4.2 Remedy Implementation

The remedial design/remedial action activities were performed by a number of respondents under a Unilateral Administrative Order (UAO) issued by EPA in June 1990. In 1997, a CD was signed, whereby the Settling Parties agreed to continue the required post closure and operation and maintenance activities and to establish the afore-mentioned easements (institutional controls).

RD activities started in March 1993 and concluded in September 1994. RA construction activities started in May 1994, including an extension of the eastern landfill slope and placing of a PVC cover over the remaining 20 percent of the landfill and installation of the gas treatment system. A landfill gas treatment system was constructed and included lateral and header pipes connecting the existing 18 vents to transfer landfill gas (under vacuum) to an enclosed 40-foot high flare unit. The system also included condensate knock-out sumps and collection pipes,

vacuum extraction blowers, a flame arrester, and a system control panel. The remedy construction concluded with the Demonstration of Compliance testing and startup of the enclosed flare in February 1995. In July 1995, post-closure monitoring activities were initiated (de maximis, 1997) and the Settling Parties, EPA, and RIDEM conducted the Pre-Final Site Inspection on July 19, 1995.

In September 1996, the Post Closure Operation and Maintenance Plan was completed and approved by EPA (de maximis, 1996) and the Final Site Inspection was conducted on November 1, 1996.

In December 1998, a system was installed to inject the condensate generated from the operation of the landfill gas collection system into the flare unit. (Previously, the condensate had been collected and shipped off-site.) Flare performance tests, conducted both with and without the condensate injection system in operation, were performed in March 1999. The results of the stack testing and modeling of maximum emissions results demonstrated that the system was in compliance with Rhode Island Air Toxics Regulation No. 22, both with and without condensate injection.

Diminishing landfill gas generation and associated mechanical problems with the flare unit and the condensate injection system led to the discontinuation of the flare unit in January 2007 and the cessation of gas collection and treatment. In early 2007, the gas collection system was modified to network wells into groups, and the network was outfitted with four fluidic (candlestick) flares as an interim measure to treat gas collected via passive pressures. The candlestick flares were approved by EPA and RIDEM in a letter dated April 5, 2007, to serve as an interim "stop-gap" measure until a permanent solution was approved. In Spring 2009, the Settling Defendants repaired the existing gas collection and enclosed flare system and conducted a study to consider alternatives to optimize the collection and treatment of the landfill gas. The existing enclosed flare unit and the blower for active gas collection system were restarted on July 27, 2009, and the system operation has been monitored continuously during this period. The condensate injection system is not expected to be operational again, however, and the condensate will not be burned in the flare, but will again be collected and shipped off-site.

4.3 Operations and Maintenance

Operation and maintenance, as well as the long-term monitoring of various media at the Site, are performed by the Settling Defendants in accordance with the CD. The 1996 Post-Closure Operation & Maintenance Plan (1996 O&M Plan) details operations, maintenance, and monitoring at the Site through the year 2025. Other related documents, the Operation and Maintenance Manual for Landfill Gas Treatment System (Emcon, May 1995) and the Operating Manual for John Zink Company's Condensate Injection System (John Zink Co., December 1998), are incorporated into the O&M Plan by reference. Activities covered by this plan, along with a brief description of issues related to each activity, are summarized below.

Landfill Inspection and Maintenance

O&M for the Site includes monthly inspections and as-needed maintenance of the security system; the landfill cover; the stormwater management system; the groundwater monitoring wells, gas extraction wells, and gas migration monitoring probes; and the landfill settlement monuments. The 1996 O&M Plan calls for the grass on the landfill cover to be cut twice per year. Chemical weed control is typically used on the roadways and drainage channels in the summer. Routine maintenance activities, as well as deficiencies and corrective actions, are described in Progress Reports sent to EPA and RIDEM

Landfill Gas Extraction and Treatment Systems Operation and Monitoring

As described above, the landfill gas extraction system (the enclosed flare) was previously operated and was reactivated in July 2009 to maintain a negative pressure across the landfill and control landfill gas migration. When in operation, monitoring of the extraction and treatment systems included monthly measurement of methane, oxygen, carbon dioxide, temperature, and vacuum at the 18 gas extraction wells; adjustment of the flow from individual wells as needed; and monitoring of methane, oxygen, carbon dioxide, flame temperature, and air flow rate at the enclosed flare. The results of these monthly inspections were documented in Progress Reports sent to EPA and RIDEM. Routine maintenance activities, as well as deficiencies and corrective actions, are also summarized in the Progress Reports. Between April 2007 and July 2009, interim fluidic flares were operating in place of the enclosed flare and were inspected for proper operation of the solar power battery and constant spark unit during monthly site inspections.

Landfill Gas Migration Monitoring

Methane concentrations at three to four landfill gas probes (GP-1, GP-4, GP-5, and GP-8) are measured monthly to evaluate the effectiveness of the extraction system in controlling landfill gas migration. The performance standard for this monitoring is 1.25% methane content. According to the 1996 O&M Plan, measurements are required at GP-1 and GP-4 to monitor potential landfill gas migration to a parcel (Lot 2) west of Oxford Turnpike, and at GP-8 to monitor potential landfill gas migration to a parcel (Lot 15) northeast of the landfill. The monitoring data is submitted to EPA and RIDEM in the Progress Reports. Since the flare shutdown in January 2007, landfill gas probes GP-2 , GP-3 and GP-6 were added to the monthly monitoring.

Flare Performance Monitoring

Blower and flare inspection and maintenance were routinely performed twice per year. Once per year, the flare inlet gas was sampled and tested for VOCs by Method TO-14. Every five years, a performance test is scheduled to be conducted to ensure that the enclosed flare is operating at the appropriate efficiency, and that flare emissions are compliant with Rhode Island Air Toxics Regulation No. 22. Because of the enclosed flare malfunction and shutdown in January 2007, the last flare inlet test was performed on December 6, 2005 and the last flare performance test was conducted on October 13, 2004. The tests are expected to resume once the enclosed flare is restarted and is operating following the pilot run which started on July 27, 2009. Prior to the flare unit shutdown, landfill gas migration was appropriately controlled when the flare was in operation.

Groundwater Monitoring

As described in the 1996 O&M Plan, the purpose of groundwater monitoring is to detect contamination that may be migrating toward off-site receptors. The O&M Plan identifies the following wells to be sampled for the groundwater monitoring program: MW-101, MW-104A, MW-102A, MW-103A, CW-5B, CW-7A, and MW-202, see Figure 2 (Attachment 1). The wells are located, so that samples may be collected from one or more of the three main hydrogeologic zones (shallow overburden kame delta deposits, deep overburden ice-contact deposits, and bedrock) that underlie the Site. The samples are analyzed for VOCs; chloride; biological and chemical oxygen demand; ammonia; total iron, lead, and arsenic; and dissolved lead and arsenic. The Spring 2009 sampling event included monitoring well CW-7B in place of

CW-7A, as well CW-7A was damaged and is no longer operable. Water levels are measured from these seven wells to determine the direction of groundwater movement.

A statistical analysis of the groundwater data from 1996 through 2005 had been performed annually and in 2006 was replaced by graphical presentation of data. As permitted by the O&M Plan, the sampling frequency was changed from semi-annual to annual starting in October 2006 because statistically significant evidence demonstrated that contamination is not increasing over time.

Surface Water Monitoring

Surface water samples are collected annually at six locations on the south and east sides of the landfill. The samples are analyzed for VOCs, arsenic, chloride, pH, and specific conductance.

Settlement Monitoring

In 1994, twelve settlement monuments were established on the landfill and two additional monuments were installed in August 1997. The monuments are surveyed annually to monitor settlement across the landfill.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

The last Five-Year Review was completed on September 28, 2004, and concluded that the remedy at the Site was currently protective of human health and the environment. The Issues and Recommendations concerning long term protectiveness identified in the previous Five-Year Review have been partially addressed, as noted in Table 5 below (and discussed in further detail in the text following):

Table 5-1
Status of Recommendations from Previous Five-Year Review
Landfill & Resource Recovery Superfund Site
North Smithfield, Rhode Island

Recommendation in 2004 Five-Year Review	Status
#1 - Delineate the plume between the landfill and the discharge area and install permanent monitoring wells. Add manganese and cadmium to the list of analytes for samples from MW-102A, MW-104A, and CW-5B for the Spring and Fall of 2005 rounds of monitoring.	Temporary monitoring wells were installed and sampled in 2006 downgradient from the landfill near Trout Brook Pond. No contamination was found in these samples. Manganese and cadmium were added to the list of analytes in the groundwater monitoring program during the October 2005 and 2006 rounds and were found at acceptable levels.
#2 - Determine the sources of the landfill odors at any gas extraction wells where they were noted. Determine if the extraction well boot/cap liner connections are sealed or if it is a possible pathway for gas escape or water infiltration.	A technical memorandum was submitted to EPA on April 14, 2005, documenting the repairs that were made to wellheads and manifolding that comprises the gas extraction system.
#3 - Institutional controls, in the form of deed restrictions, need to be finalized.	Institutional controls have been drafted for the Site, but have not yet been finalized.

In response to Recommendation #1, temporary downgradient monitoring wells were installed near Trout Brook Pond in 2006. These activities were documented in the June 2006 report: Results for the Groundwater Geoprobe Sampling Points (O&M, Inc., 2006). The results of sampling documented in the report did not identify groundwater contamination near Trout Brook Pond. Because groundwater contamination was not identified in any of the Geoprobe sample points, and because there is some uncertainty regarding the sample locations/elevations (as the wells were not surveyed), the precise downgradient extent of the plume between the landfill edge and the Trout Brook Pond is still uncertain. However, the VOC concentrations in the groundwater monitoring wells beyond the landfill footprint have been steadily declining over the last five years.

In response to Recommendation #2, the gas recovery wellheads and manifolding were repaired in early 2005. The base of the wellhead vault areas was excavated so that the liner/well seal was exposed and could be inspected. The wellheads that were repaired were also retrofitted with above-grade manifolding.

In November 2008, following the active gas collection blower and flare shutdown, forty-five temporary gas monitoring probes were installed to investigate landfill gas migration, see Figure 2 (Attachment 1). The gas monitoring probes were installed to an approximate depth of nine

feet below ground surface (bgs). On November 22, 2008, screening of methane levels was conducted at a total of 52 monitoring locations (the pre-existing gas probes (GP-1 through GP-6 and GP-8) and the temporary gas monitoring probes). The performance standard of 1.25% methane established for the Site was exceeded at 25 of the locations along the entire perimeter of the landfill. On January 20, 2009, 45 locations were screened again. The performance standard for methane was exceeded at 18 of the locations, and some of the methane levels detected at GP-1, GP-2, GP-3, GP-4, GP-5, and GP-6 were as high as 65% methane. Thus, results of the January 2009 monitoring event were consistent with the results of the November 2008 monitoring.

In response to Recommendation #3, RIDEM and EPA have drafted Land Usage Restrictions, which were provided to the Settling Defendants in early 2009. Discussions with the Settling Defendants on finalizing and recording these deed restrictions are ongoing.

Additionally, according to the 2004 Five-Year Review, the Settling Defendants proposed the following modifications to the Post-Closure O&M Plan in June 2002:

- Reduction in the number of monitoring wells sampled from seven to five and reduction of groundwater sampling frequency from semi-annual to annual;
- Elimination of annual ambient air sampling from the monitoring program; and
- Elimination of the annual flare inlet gas sampling.

The frequency of the groundwater monitoring was changed in 2007 without a formal approval from EPA or RIDEM. The elimination of the ambient air sampling was approved by RIDEM and EPA in a letter dated September 21, 2004. The annual flare inlet gas sampling has not been conducted since December 2005 due to the shutdown of the enclosed flare in January 2007. The Agencies have not approved elimination of the annual flare inlet gas sampling and it is anticipated that annual flare inlet sampling will be conducted once the flare system is operational.

6.0 FIVE-YEAR REVIEW PROCESS

This section summarizes the Five-Year Review process and the actions taken by EPA to complete this Five-Year Review.

6.1 Administrative Components

EPA, the lead agency for this Five-Year Review, notified RIDEM and the Settling Defendants in early 2008 that the Five-Year Review process would be commencing shortly. The Five-Year Review Team was led by Anna Krasko of EPA, Remedial Project Manager for the Site, and included staff from Nobis Engineering, Inc., EPA's technical support contractor. Shelley Ducharme, of RIDEM, was also part of the review team.

Beginning in March 2009, the review team established a schedule to review components that included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspections and Observations;
- Local Interviews; and
- Five-Year Review Report Development and Review.

6.2 Community Notification and Involvement

EPA notified the community in a public notice that was published on May 28, 2009 in The Valley Breeze, a local newspaper, that a review of the progress of the Site was being conducted. A copy of the public notice is included in Attachment 6. The Agencies received no inquiries from the public following publication of that notice.

6.3 Document Review

This Five-Year Review consisted of a review of relevant documents including decision documents and monitoring reports. The documents reviewed are listed in Attachment 2.

6.4 Data Review

Data collected by the Settling Defendants were evaluated to assess whether landfill gas is contained and managed, contaminants within the landfill are being contained by the cap, and whether the air contaminant concentrations have achieved the ROD target cleanup levels. A summary of the data review by media is provided below.

Groundwater

Beginning in 2007, the frequency of the groundwater monitoring was changed to annual sampling, and 2006 was the last year of semi-annual groundwater monitoring. The 2009 annual sampling round was conducted during the preparation of this Five-Year Review report and review of the available preliminary data indicates that the groundwater contaminant levels and trends are consistent with last years of monitoring. The following wells currently comprise the monitoring network: MW-101, MW-202, MW-102A, MW-103A, MW-104A, CW-7A, and CW-5B. (No sample could be collected from CW-7A in 2007 or 2008 due to well obstruction and at EPA's recommendation, the neighboring monitoring well CW-7B was sampled in lieu of CW-7A for the 2009 sampling round.)

Groundwater elevation data indicates that the groundwater is flowing in an east-northeasterly direction. Therefore, monitoring well MW-102A is located downgradient from the landfill. During every sampling round from 2005 through 2008, MCL exceedances of the following VOCs have been detected in MW-102A: cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride, indicating that contaminated groundwater is migrating beyond this well, toward the abutting lot and Trout Brook Pond.

In monitoring well CW-5B, the concentration of tetrachloroethene exceeded the MCL during both the sampling rounds in 2006 and during the annual sampling rounds in 2007 and 2008. Concentrations of arsenic (total and dissolved) were detected in monitoring well MW-104A above the MCL in 2005 through 2008.

Since 1996, in monitoring wells CW-5B, MW-102A and MW-104A, the highest concentrations of several VOCs were generally found between years 2000 and 2004. More recently these concentrations have been steadily declining over the last 3-5 years, with several compounds either approaching or found below their respective MCLs. See Contaminant Trends Graphs in Figure 3 (Attachment 1).

Surface Water

Surface water is monitored annually at six locations: SW-5, SW-8, SW-10, SW-16, LCH-3, and LCH-5. During the May 2007 sampling round, arsenic was detected above the RIDEM Water Quality Criteria at two locations: SW-8 and SW-16. During the May 2008 sampling round, arsenic was detected above the RIDEM Water Quality Criteria in three locations: SW-16, SW-5,

and SW-8. All of these surface water monitoring points are located in the wetlands on the eastern side of the landfill.

Landfill Gas

In order to monitor the migration of landfill gas and also test the performance of the landfill gas collection system, monthly monitoring is typically performed at the 18 gas wells and the four perimeter gas probes (an additional three perimeter gas probes have been added to the monitoring program since the flare shutdown). Screening is conducted for the following parameters: methane, carbon dioxide, oxygen, and temperature. A performance standard of 1.25% methane has been established for the Site. Methane concentrations in excess of this level have been detected since shutdown of the flare in January 2007. (Refer to Section 5.0 for a discussion of the temporary landfill gas monitoring probes that were installed in November 2008.) These probes were also screened for the above-listed parameters in November 2008 and January 2009.

Flare Performance Monitoring

The flare inlet gas sampling was last conducted on December 6, 2005. Due to shutdown of the flare in January 2007, the annual flare inlet gas sampling scheduled for that time could not be conducted. According to the Flare Inlet Test Report (O&M, Inc., 2006) the results of the testing in 2005 were consistent with past results, and no issues were identified. This sampling is expected to be resumed once the enclosed flare is reactivated and is operational. The last Five-year Flare Performance Test was conducted on October 13, 2004, and is not scheduled to occur again until Fall 2009, once the flare becomes operational.

6.5 Site Inspection

The Five-Year Review Site Inspection to assess the protectiveness of the remedy was conducted on April 29, 2009. The inspection was conducted by Ms. Anna Krasko and Mr. Mike Jasinski of EPA, Ms. Shelley Ducharme of RIDEM, and Ms. Danielle Gray of Nobis. The site-specific checklist used to document the observations made during the inspection is included in Attachment 4.

A summary of the observations identified during the 2009 Site inspection are discussed below. Photographs documenting the Site conditions are included in Attachment 5.

- **Landfill Surface** - The landfill surface was generally in good condition with healthy vegetation that appeared to be well maintained and no obvious signs of settlement, erosion, bulges, or cracks.
- **Cover Penetrations** - There did not appear to be any problems with the cover penetrations, which include gas wells and condensate sumps. No odor of landfill gas was noted in the vicinity of the cover penetrations. The above-ground manifolding which connects the gas wells was also observed to be in good condition.
- **Roadways and Perimeter Channels** – The *perimeter road* appeared to be in good condition with no signs of erosion. The perimeter channels and the detention basins appeared to be in good condition with well-maintained vegetation. No evidence of sedimentation was observed in the perimeter channels, however iron fouling was present.
- **Site Fences and Signage** – The perimeter fence around the landfill cap was observed to be in good condition. One large hole was observed in the fence on the northwestern side of the landfill, but there was no evidence of trespassing. "No Trespassing" signs, in good condition, were posted at regular intervals along the perimeter fence. The hole in the fence needs to be repaired.
- **Monitoring Wells** – All of the monitoring wells at the Site are located around the perimeter of the landfill cap. All monitoring wells were observed to be properly secured and in good condition.
- **Gas Probes** – Seven gas probes, all labeled with signs, are located around the perimeter of the landfill cap and were observed to be in good condition.
- **Temporary Gas Monitoring Probes** – A portion of the 45 gas monitoring probes installed in November 2008 were located and inspected. Several of the monitoring probes were observed to be missing the stake and yellow flagging. The stakes and flagging should be replaced to facilitate location of the temporary monitoring probes in the future.

- **Wetlands** – The wetlands on the eastern side of the landfill were observed from within the perimeter fence. Iron fouling was apparent in the wetland areas visible from the landfill perimeter road.
- **Blower Building and Enclosed Flare** – The blower building was in good condition. The enclosed flare was not operating on the day of the Site inspection but was observed to have been recently repaired. A strong landfill gas odor was present in the vicinity of the blower building. The source of the odor was not readily apparent; however the condensate knock-out sump was identified as a possible source. A 2,500-gallon condensate underground storage tank (UST) is located near the Blower Building.
- **Candlestick Flares** – Four candlestick flares are currently located on top of the landfill and were observed to be functioning.

6.6 Interviews

Interviews were conducted with local town officials and persons with knowledge of the Site. The primary objective of the interviews was to obtain general information about current activities at the Site. Refer to Attachment 3 for summaries of the interviews conducted.

7.0 TECHNICAL ASSESSMENT

This section provides a technical assessment of the remedy implemented at the Site. In accordance with the Comprehensive Five-Year Review Guidance (EPA, 2001b) the assessment examines the following three questions, which provide a framework for organizing and evaluating data and information and ensures that all relevant issues are considered when determining the protectiveness of the remedy:

- Question A – Is the remedy functioning as intended by the decision documents?
- Question B – Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
- Question C – Has any other information come to light that could call into question the protectiveness of the remedy?

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

No. As discussed below, the review of documents, ARARs, and risk assumptions indicates that the remedy is not currently functioning in accordance with the 1988 ROD, as modified by the ESDs.

Construction of the remedy was completed in accordance with the ROD. Operation and maintenance of the cap and drainage structures have been effective. A gas collection and treatment system is in place to reduce landfill gas emission to ambient air and migration. Ambient Air Levels (AALs) promulgated under Rhode Island Air Toxics Regulations were selected as the target cleanup levels for gaseous emissions from the Site. Compliance with the AALs requires modeling of annual average ambient air concentrations at the Site perimeter from stack emissions data, rather than direct measurement of ambient air concentrations. The flare performance and flare inlet testing results and subsequent modeling demonstrated compliance with RIDEM's AALs when the enclosed flare is operational (Performance Stack Test Report (January 2005)). Also, flare inlet VOC concentrations have been decreasing since the start of flare operation. In 2007, the Settling Defendants conducted an emissions and migration evaluation, including modeling of ambient air and comparisons to AALs, under the then open vent conditions. RIDEM reviewed the results and concluded that the site was not in compliance under the open vent condition. As noted above, the active flare system was reactivated on July 27, 2009. Flare performance tests and modeling of emissions to compare with AALs will need to be done after the active landfill gas collection system and enclosed flare system is operational again to determine compliance.

With respect to landfill gas migration, when the blower and enclosed flare system are operational, the Site has achieved the performance standards. In the past, during short-term gas collection and flare system shutdowns due to malfunctions and repairs, elevated levels of methane gas were found in the monitoring probes. As noted above, the blower and enclosed flare system have not operated since January 2007. As an interim measure, the system was replaced with passive fluidic flares. The wide-spread exceedance of the acceptable methane concentrations around the landfill currently indicates that the passive gas collection system with four fluidic flares is not controlling the landfill gas being generated by the landfill. EPA, RIDEM and the Settling Defendants have been discussing options to control gas migration and

emissions from the landfill. The blower system and enclosed flare was repaired in April 2009 and the system has now been restarted and is expected to control landfill gas migration and emission at the Site adequately.

Groundwater samples collected from monitoring wells just north and east of the landfill on parcels associated with the power line right-of-way have shown that groundwater contamination is present in the deep overburden just beyond the landfill footprint. The concentrations of several VOCs and arsenic exceed their respective MCLs.

The full extent of the groundwater plume to the north and east of the landfill has not been completely delineated. However, the VOC concentrations in the groundwater monitoring wells beyond the landfill footprint have been steadily declining over the last five years. The absence of contamination in MW-202, located between Pound Hill Road and the wetlands and streams east of the Site, shows that the contamination has not migrated to that point east of the landfill. It is also possible that the contamination attenuates to concentrations below the MCLs prior to discharge into the Trout Brook Pond. Movement of the plume to the east of these surface water bodies is not indicated since they are groundwater discharge areas. There are no known monitoring or supply wells within the projected path of the plume. However, the potential for future groundwater use in the east-northeasterly direction, downgradient of the Site suggests that a future risk may exist.

The CD requires institutional controls to be put in place on a number of parcels. These controls will generally restrict the use of groundwater and surface water, prohibit disturbance of the cap, and prohibit use of the property in any way that would disturb remedial measures taken. EPA is currently discussing draft easements with RIDEM and the Settling Defendants. Except for the landfill, the property is undeveloped and there is no planned or likely use that would be contrary to the contemplated Institutional Controls. A review of activities conducted on these parcels indicates that no one is currently using these properties in a manner inconsistent with the contemplated institutional controls.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

Yes. There are no changed or new land uses, including zoning changes, changed or new routes of exposure or receptors, or changed physical conditions that could result in increased exposure and may affect the protectiveness of the remedy. The Remedial Action Objectives (RAOs) used at the time of the remedy selection are still valid, except that the 1991 ESD eliminated the wetlands remediation requirements.

Changes in Standards or To Be Considered (TBCs)

In accordance with guidance, this review considered changes in standards that were identified as ARARs in the 1988 ROD, newly promulgated standards for chemicals of potential concern and TBCs identified in the ROD. A list of the ARARs is included in Attachment 7.

Air emissions of VOCs were recognized as the greatest component of human health risk in the ROD. Accordingly, Rhode Island Air Toxics Regulations AALs were selected as the target cleanup levels for gaseous emissions under the remedy. The AALs are derived based on risk and represent the concentration of a substance that a facility may contribute to the ambient air at or beyond its property line. They are developed for three averaging times: one-hour for acute effects; 24-hours for effects associated with intermediate length exposures; and annual for chronic effects. The AALs were updated since the 1997 CD was entered, most recently in the October 2008 revision of the regulation, which is based on updated toxicity information and encompasses more contaminants. For the VOCs listed as contaminants of concern in the ROD, with the exception of toluene, the revised AALs are either the same or less stringent than the levels listed in the CD. The annual average AAL for toluene has decreased from 400 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) to 300 $\mu\text{g}/\text{m}^3$ based on the lower California chronic Reference Exposure Level (REL). While the updated toluene AAL would be somewhat more protective, EPA would consider the previous level to still be protective.²

² Assuming the receptor (a resident) inhales air at a concentration of 0.400 mg/m³ (400 ug/m³) continuously for 30 years, the resulting hazard index using the current IRIS RfC of 5 mg/m³ would be less than 0.1, which is acceptable.

Changes in Exposure Pathways

The human health exposure pathways considered in the Public Health and Environmental Assessment (Ebasco, 1988) performed during the RI included: (1) ingestion of groundwater as drinking water; (2) children exposed to surface water and sediment while wading in nearby streams; and (3) future children exposed to gas emissions from the landfill. Because groundwater at the landfill boundaries met drinking water criteria and testing of nearby residential wells showed no site-related impacts, exposures to groundwater were deemed acceptable at the time of the ROD. Risks from surface water and sediment exposures were also considered insignificant. The greatest risks resulted from exposures to landfill gas emissions.

Although groundwater contaminants have now been detected beyond the edge of the landfill at concentrations exceeding their respective MCLs, the possibility of future property development in the impacted area and thus, potential risk for human exposure from groundwater contact and vapor intrusion is considered low. Institutional controls, once established, will prevent future exposure to groundwater and vapor.

The Public Health and Environmental Assessment also considered children exposed to surface water and sediment while wading in nearby streams from dermal exposure only. The incidental ingestion pathway was not considered because the nearby streams are shallow, and a swimming scenario, including incidental ingestion of surface water, was considered unlikely. Current standard practice in risk assessment, however, would include evaluation of incidental ingestion of sediments for wading scenarios. Nevertheless, the change in exposure assumption for this receptor are unlikely to result in a change in the conclusion of the risk assessment since contaminants in sediment and surface water are detected at low levels and infrequently.

Changes in Toxicity and Other Contaminant Characteristics

Since the 1988 Public Health and Environmental Assessment, EPA has re-examined and updated toxicity factors for the majority of the contaminants evaluated.

Since 1988, EPA has issued guidance (EPA RAGS F, 2005) recommending use of inhalation unit risk factors and reference concentrations as inhalation toxicity factors for evaluating inhalation exposures, rather than the inhalation cancer slope factors and inhalation reference doses used in the RI. Revised inhalation toxicity factors have been developed and/or accepted

by EPA for benzene, cis-1,2-DCE, ethylbenzene, and toluene, each of which were evaluated in the RI and were detected in the most recent flare inlet sampling (December 2005). Inhalation toxicity factors are also available for chlorobenzene, 1,2,4-trimethylbenzene, vinyl chloride, and xylenes, which were detected in the most recent flare inlet sampling (December 2005), but were not detected and not evaluated in the RI risk assessment. Inhalation toxicity factors are currently available for several VOCs that were detected in vent emissions during the RI, but excluded from the risk evaluation because of a lack of inhalation toxicity factors. However, since these contaminants (including bromoform, bromodichloromethane, 1,1-DCA, 1,2-DCE, 1,1,1-TCA, and 1,2-dichloropropane) were not detected in the most recent flare inlet sampling (December 2005), the availability of toxicity factors does not impact current or future protectiveness.

EPA has not developed dermal toxicity factors; however, EPA Dermal Guidance (EPA RAGS E, 2004) recommends developing dermal toxicity factors from oral toxicity factors with chemical-specific adjustment factors to convert the administered toxicity factors to absorbed toxicity factors. The dermal guidance also provides chemical-specific dermal absorption factors to aid in estimation of dermal dose estimates. These were not available at the time of the RI.

Re-calculation of risks using current toxicity factors and absorption factors may differ somewhat from those previously estimated. Therefore as part of this five-year review, EPA evaluated the inhalation risk for the residential exposure scenario based on the most recent flare performance test conducted in 2004 and concluded that the very conservative risk estimate for the compounds detected in the effluent from the stack remains within EPA's acceptable risk range. Changes in these chemical-specific factors, therefore, have not affected the protectiveness of the remedy. As noted above, levels of contaminants in the groundwater are declining with several compounds either approaching or found below their respective MCLs during the most recent years of sampling.

Changes in Risk Assessment Methods

Since the Public Health and Environmental Assessment (Ebasco, 1988) and the 1988 ROD, changes have been adopted to the formulas used to calculate risks from exposures to ambient air, surface water, sediment, and groundwater.

Although calculated risks from these potential exposure pathways may differ somewhat from those previously estimated, the revised methodologies are not expected to affect the protectiveness of the selected remedy.

New Contaminants and/or Contaminant Sources

No new contaminant sources have been identified since startup of the remedy. However, contaminants not detected at the time of the remedy selection are currently present in site media. Dioxin-like PCBs, dioxins and furans, chloromethane, and xylenes, present in the most recent stack emissions sampling (October 2004), were not detected in the RI vent sampling and, therefore, were not evaluated in the risk assessment. Several VOCs (chlorobenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, vinyl chloride, and xylenes) present in the most recent flare inlet sampling (December 2005), were not detected in the RI vent sampling and, therefore, were not evaluated in the risk assessment. Tetrachloroethene and trichloroethene were detected in vent sampling and considered as contaminants of concern for the evaluation of air emissions. Several VOCs (cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride) present in groundwater in May 2008 at levels exceeding MCLs, were not detected in the RI groundwater sampling and, therefore, not evaluated in the risk assessment. 1,4-dichlorobenzene present in surface water in May 2008 at levels exceeding RIDEM AWQCs for aquatic life, was not detected in the RI surface water sampling and, therefore, not evaluated in the risk assessments.

The most recent stack emissions testing (October 2004) demonstrated compliance with AALs.. AALs are available for each of the new contaminants detected in the most recent flare inlet sampling (December 2005) except the trimethyl benzenes. As discussed above, inhalation risk for the residential exposure scenario based on compounds detected in the stack effluent in the most recent flare performance test conducted in 2004 remains within EPA's acceptable risk range. Therefore, presence of these additional compounds have not impacted protectiveness of the remedy.

7.3 Question C: Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No. The May 2008 post-closure surface water monitoring indicates presence of contamination in surface water at levels exceeding current RIDEM Ambient Water Quality Criteria (AWQC) for

aquatic life for 1,4-dichlorobenzene. Vinyl chloride and arsenic concentrations in surface water samples also exceed RIDEM AWQC for human health. The surface water at the Site is not used as a drinking water source and is not a fishing area. Surface water and groundwater monitoring data will continue to be collected and evaluated to ensure that the landfill cap is functioning as designed.

7.4 Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, there have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. However, the blower and flare system is not currently operating and, therefore, the current system does not control the migration of landfill gas from the landfill. As a result, methane gas has been detected beyond the landfill footprint at concentrations above the performance standard of 1.25%. Groundwater monitoring has detected the presence of contaminants just beyond the landfill edge, but no groundwater supply wells are currently known to exist within the plume and the potential for future exposure to groundwater in this area between the landfill and nearby wetland is low. Institutional Controls need to be finalized to ensure that the remedy remains protective in the future.

8.0 ISSUES

Based on the activities conducted during this Five-Year Review, the issues identified in Table 2 have been noted.

**Table 2
Issues
Landfill and Resource Recovery Superfund Site
North Smithfield, Rhode Island**

Issues	Affects Current Protectiveness	Affects Future Protectiveness
The interim four fluidic flares and passive landfill gas collection system are not adequately controlling landfill gas migration at the Site.	Yes	Yes
Several contaminants are present in groundwater beyond the landfill boundary at concentrations above MCLs,	No	Yes
Required Institutional Controls have not been finalized.	No	Yes

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 3 be taken:

Table 3
Recommendations and Follow-up Actions
Landfill and Resource Recovery Superfund Site
North Smithfield, Rhode Island

Issue	Recommendation and Follow-up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
The interim four fluidic flares and passive landfill gas collection system are not adequately controlling landfill gas migration at the Site.	Restart the enclosed flare and active landfill gas collection system and conduct performance testing and modeling to confirm compliance with performance standards.	Settling Defendants	EPA	06/31/10	Yes	Yes
Several contaminants are present in groundwater beyond the landfill boundary at concentrations above MCLs,	Continue monitoring the existing well network and continue to evaluate declining trends in groundwater VOCs concentrations and the need for additional plume delineation and monitor effectiveness of the existing landfill closure.	Settling Defendants	EPA	12/30/12	No	Yes
Required Institutional Controls have not been implemented.	Finalize Land Usage Restrictions and record ICs on affected properties; and memorialize the ICs requirement in a decision document.	Settling Defendants	EPA	12/31/10	No	Yes

10.0 PROTECTIVENESS STATEMENT(S)

A protectiveness determination of the remedy at the L&RR Superfund Site cannot be made at this time until further information is obtained. Further information will be obtained by restarting the enclosed flare and active landfill gas collection system and conducting performance testing and modeling to confirm compliance with performance standards. It is expected that these

actions will take approximately 15 months to complete, at which time a protectiveness determination will be made.

11.0 NEXT REVIEW

The next Five-Year Review will be conducted by September 2014.

ATTACHMENT 1

SITE FIGURES



USGS TOPOGRAPHIC MAP
 GEORGIATVILLE, RHODE ISLAND
 1975

APPROXIMATE SCALE
 1 INCH = 2,000 FEET



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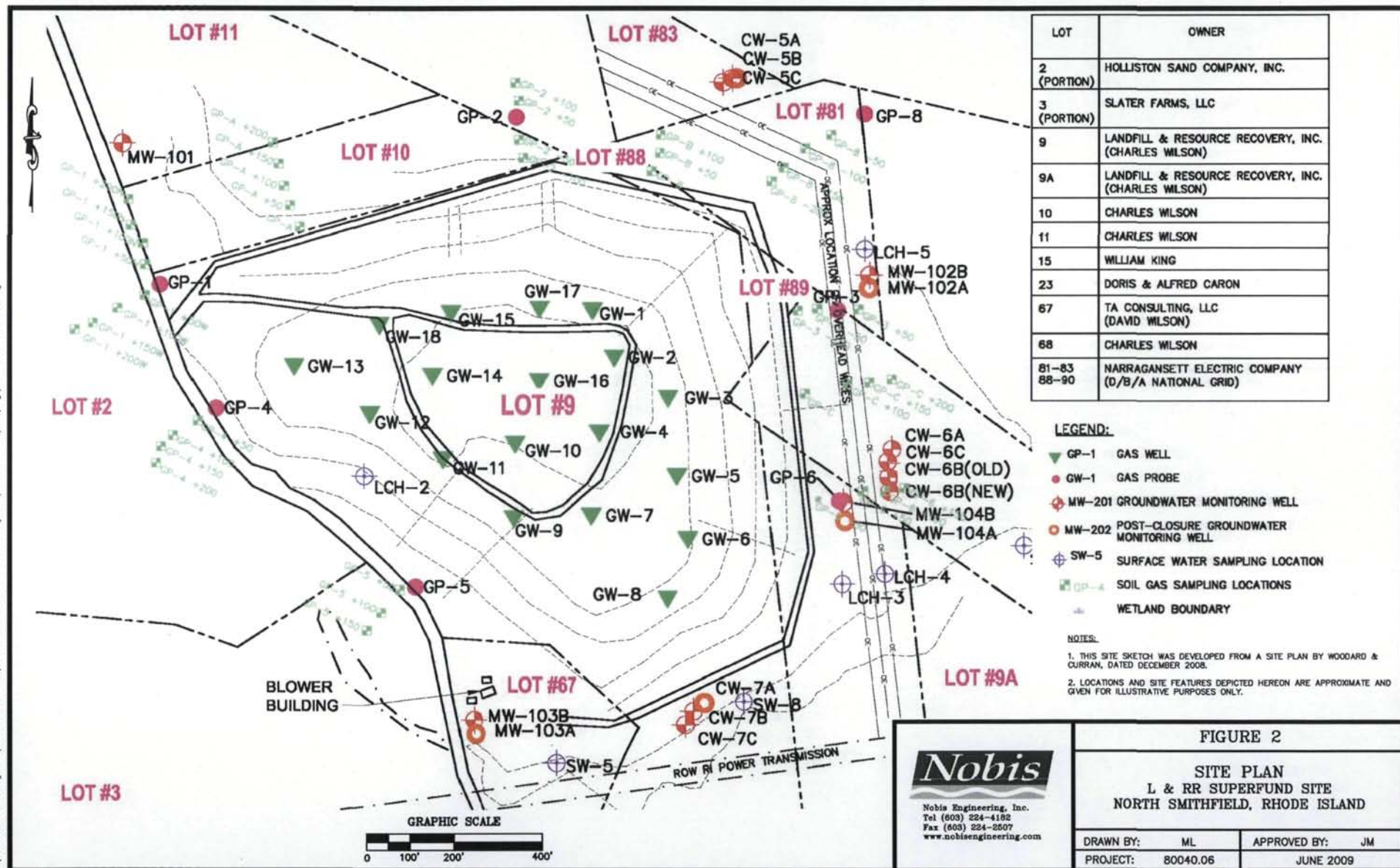
QUADRANGLE LOCATION

FIGURE 1

LOCUS PLAN
 L & RR SUPERFUND SITE
 NORTH SMITHFIELD, RHODE ISLAND

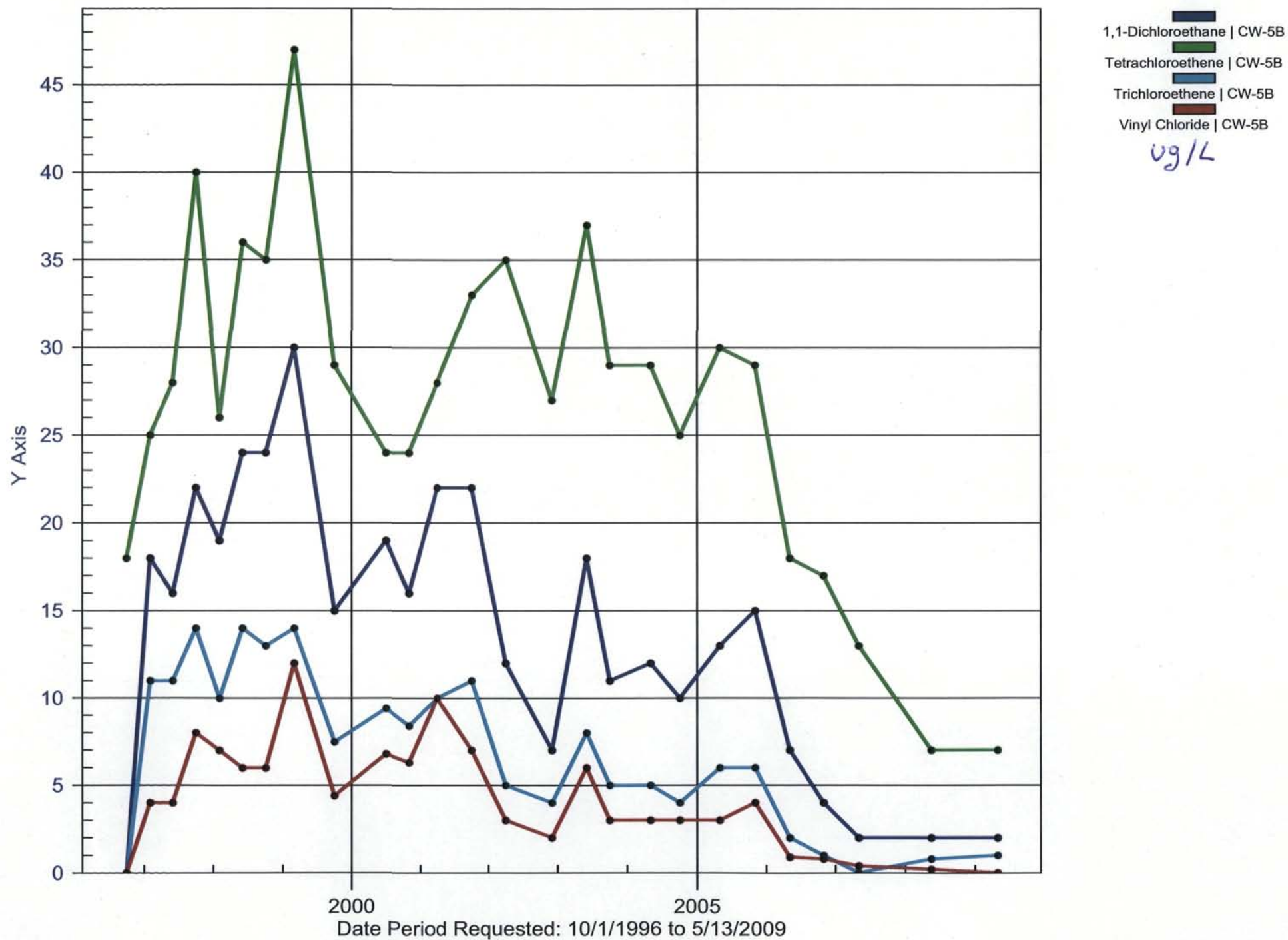
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JUNE 2009



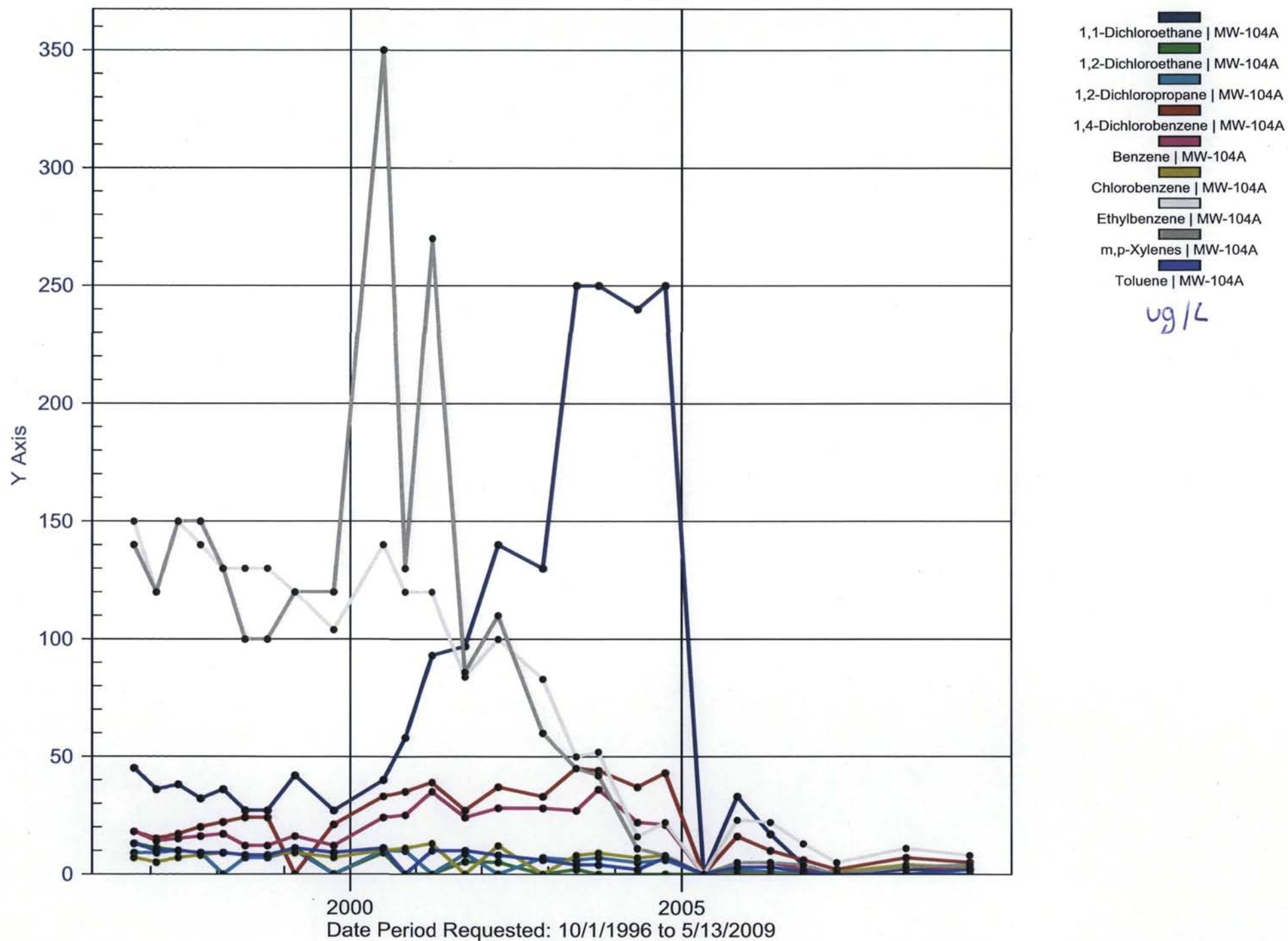
Parameter trending for Site: CW-5B

Parameter Group: _CW5B_Graph



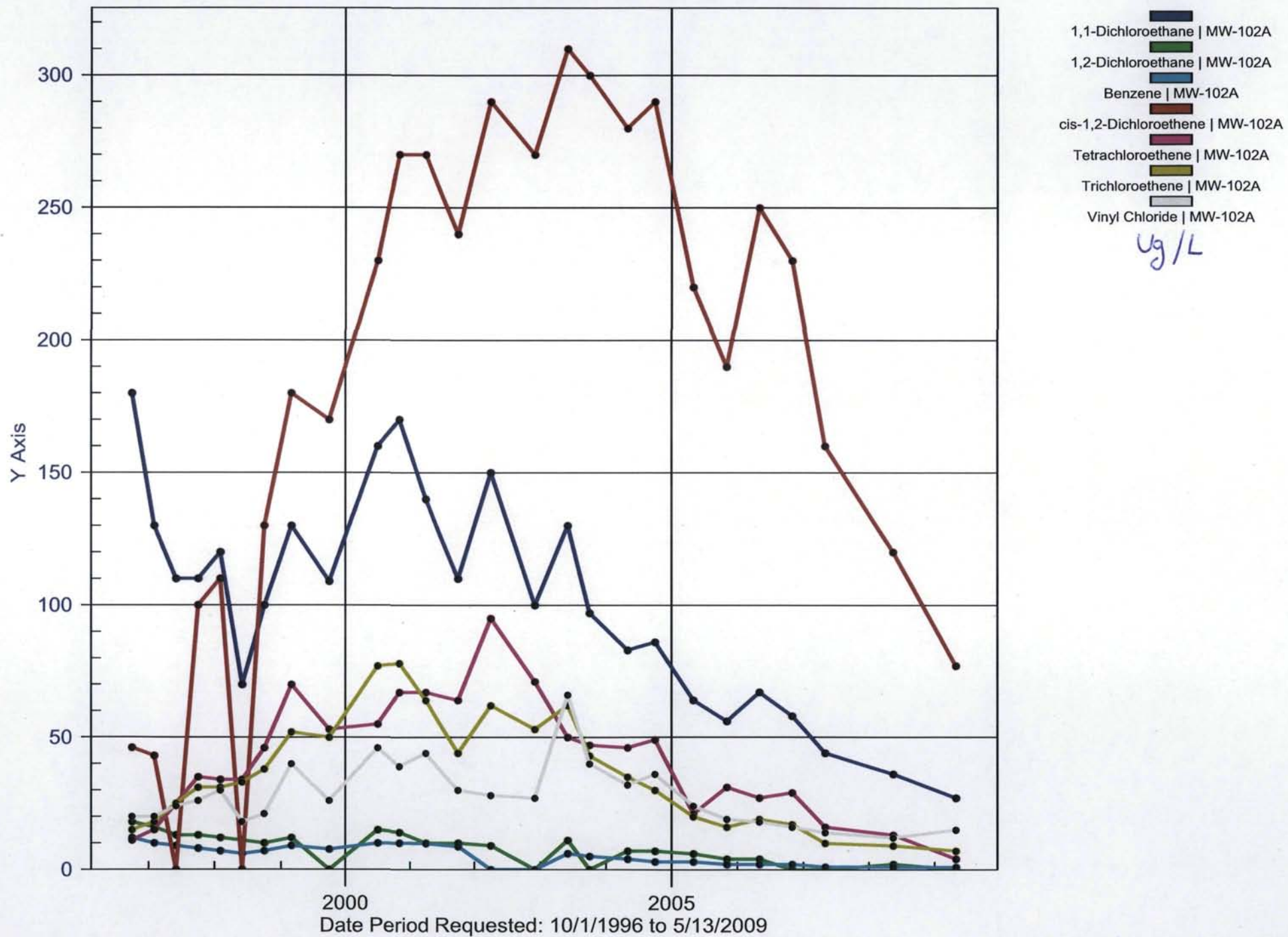
Parameter trending for Site: MW-104A

Parameter Group: _MW104A_GRAPH



Parameter trending for Site: MW-102A

Parameter Group: _MW102A_Graph



ATTACHMENT 2

DOCUMENT REVIEW LIST/REFERENCES

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O&M, Inc., 2007. Landfill and Resource Recovery (L&RR) Superfund Site, Post-Closure Site Monitoring Report, July through December 2006. O&M, Inc., January 10, 2007.

O&M, Inc., 2007. Landfill and Resource Recovery (L&RR) Superfund Site, Annual Post-Closure Site Monitoring Report 2007. O&M, Inc., August 14, 2007.

O&M, Inc., 2008. Landfill and Resource Recovery (L&RR) Superfund Site, Annual Post-Closure Site Monitoring Report 2008. O&M, Inc., September 19, 2008.

O&M, Inc., 2009. Technical Memo Well Field Optimization Program for Methane Migration Control, L&RR Superfund Site, N. Smithfield, Rhode Island. O&M, Inc., April 16, 2009.

Woodard & Curran, 2008. Landfill Gas Recovery System – Focused Feasibility Study Scope of Work. Woodard & Curran, September 2008.

Woodard & Curran, 2008. L&RR Landfill Gas Survey Results. Woodard & Curran, December 10, 2008.

Woodard & Curran, 2009. L&RR Landfill Gas Survey Results. Woodard & Curran, January 20, 2009.

Woodard & Curran, 2009. Alternatives Investigation. Woodard & Curran, March 9, 2009.

ATTACHMENT 3
INTERVIEW SUMMARIES

INTERVIEW RECORD			
Site Name: Landfill & Resource Recovery, Inc. (L&RR)		EPA ID No.: RID093212439	
Subject: Third Five-Year Review (2009)		Time: 11:30	Date: 5/7/2009
Type: <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> Visit <input type="checkbox"/> Other Location of Visit:		<input type="checkbox"/> Incoming <input checked="" type="checkbox"/> Outgoing	
Contact Made By:			
Name: Danielle Gray		Title: Project Scientist	Organization: Nobis Engineering, Inc.
Individual Contacted:			
Name: Shelley DuCharme		Title:	Organization: Rhode Island Department of Environmental Management (RIDEM)
Telephone No: 401-222-2797 ext.7158		Street Address: 235 Promenade Street	
Fax No:		City, State, Zip: Providence, RI 02908	
E-Mail Address: shelley.ducharme@dem.ri.gov			
Summary Of Conversation			

Q: What is your overall impression of the project? (general sentiment)

A:

Q: Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the Site? If so, please give purpose and results.

A: Yes. Monthly reports are provided to RIDEM by the PRP. Site inspections and communication with the PRP are performed on an as needed basis. The PRP informs RIDEM when they will be on site to perform sampling activities.

Q: Have there been any complaints, violations, or other incidents related to the Site requiring a response by your office? If so, please give details of the events and results of the responses.

A: None in the last five years. One complaint about fugitive dust from a property owner south of the landfill.

Q: Do you feel well informed about the site's activities and progress?

A: Yes. Most communications regarding the site are with EPA.

Q: Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

A: No.

Q: What is the status of the institutional controls?

A: Institutional controls have been drafted but not yet finalized. PRPs are expected to work with abutting property owners to finalize institutional controls.

Q: What media are being sampled and at what frequency? What is the status of the request by the PRP to change the frequency of sampling?

A: Groundwater sampling has been decreased from semi-annual to annual. NO concurrence. This change was made without the approval of RIDEM.

Q: What is the status of the monitoring for manganese and cadmium in groundwater?

A:

Q: RI State laws have been updated since the last Five-Year Review. Are you aware of regulation changes that are applicable to the Site?

A:

Q: Are there any local town officials or residents that you recommend be contacted concerning this Five-Year Review?

A:

INTERVIEW RECORD

Site Name: Landfill & Resource Recovery, Inc. (L&RR)		EPA ID No.: RID093212439	
Subject: Third Five-Year Review (2009)		Time: 1030	Date: 5/15/2009
Type: <input checked="" type="checkbox"/> Telephone <input type="checkbox"/> Visit <input type="checkbox"/> Other		<input type="checkbox"/> Incoming <input checked="" type="checkbox"/> Outgoing	
Location of Visit:			
Contact Made By:			
Name: Danielle Gray Gail DeRuzzo Jim Doherty, PE, LSP		Title: Project Scientist Lead Chemist Senior Project Manager	
Organization: Nobis Engineering, Inc.			
Individual Contacted:			

Name: David Fuerst Jack McBurney	Title: Project Manager at O&M, Inc. Project Manager at <i>de maximis, inc.</i>	Organization: O&M, Inc. and <i>de maximis, inc.</i>
Telephone No: (860) 298-0871 Fax No: (860) 298-0561 E-Mail Address:	Street Address: 200 Day Hill Road, Suite 200 City, State, Zip: Windsor, CT 06095	
Summary Of Conversation		
<p>Q: What is your overall impression of the project? A: The remedy is functioning as intended.</p> <p>Q: Is the remedy functioning as expected? How well is the remedy performing? A: Yes. The remedy continues to be protective.</p> <p>Q: What does the monitoring data show? Are there any trends that show contaminant levels are decreasing? A: The contaminant concentrations in groundwater are declining. Only three of the wells sampled have ever shown contamination. No contaminants above applicable standards have been detected in surface water, except arsenic. Landfill gas quantity has degraded as expected.</p> <p>Q: Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, please describe staff and frequency of site inspections and activities. A: There is no continuous O&M presence at the Site. Two people perform monthly inspections to monitor the landfill gas probes and check the general site conditions.</p> <p>Q: Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. A: The active flare was shutdown in January 2007. Four fluidic flares were installed as a temporary solution. There are plans to turn the active flare back on, but this is pending EPA approval. Also, 45 temporary gas probes were installed on and around the Site to characterize the migration of landfill gas, including the methane concentration of the landfill gas. The temporary gas probes show elevated levels of methane.</p> <p>Q: Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details. A: The cost of installing the four fluidic flares when the active flare failed.</p> <p>Q: Have there been opportunities to optimize O&M, or sampling efforts? Please describe changes and results or desired cost savings or improved efficiency. A: In 2007, the frequency of groundwater sampling was changed from semi-annual to annual, per the O&M Plan. Also, O&M, Inc. has requested that some of the on-site wells no longer be sampled. This request is pending EPA approval.</p> <p>Q: Do you have any comments, suggestions, or recommendations regarding the project? A: O&M, Inc. has proposed to restart the active flare and some minor changes to the monitoring program at the Site, as discussed above.</p>		

<p>Q: What is the status of the groundwater monitoring for manganese and cadmium? A: Manganese and cadmium were added to the groundwater monitoring program during both semi-annual rounds of 2005 and 2006. No detections above applicable standards were detected; hence it was approved for these to be removed from the groundwater monitoring program.</p> <p>Q: RI State laws have been updated since the last FYR. Are you aware of regulation changes that are applicable to the Site? A: Not that they are aware of. The Rhode Island Department of Environmental Management (RIDEM) has not made them aware of any such changes.</p>
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Q: What standards are the surface water data being compared to?

A: Per RIDEM's request, the data is compared to the Rhode Island Surface Water Quality standards.

Q: What is the roll-off that is currently on-site being used for?

A: It is on-site to dispose of the garbage and debris that was generated during the repairs to the manifold between the gas wells.

Q: Is Ambient Air Monitoring being performed?

A: No. The cessation of the annual ambient air monitoring was approved by the EPA and RIDEM.

Q: Is any modeling of Ambient Air Concentrations being performed?

A: No.

Q: Do landfill gas monitoring activities include screening or sampling for volatile organic compounds (VOCs)?

A: No. The goal of the screening that is currently performed is to characterize the methane content of the landfill gas subsurface migration emissions. The four fluidic flares that are currently operating on-site are not screened or sampled. There is a requirement for stack sampling of the active flare every five years, but because the flare has been inactive, that has not been done since 2004.

ATTACHMENT 4
SITE INSPECTION CHECKLIST

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Landfill & Resource Recovery, Inc. (L&RR)	Date of inspection: April 29, 2009
Location and Region: North Smithfield, RI, Region 1	EPA ID: RID093212439
Agency, office, or company leading the five-year review: EPA, RIDEM, Nobis Engineering, Inc.	Weather/temperature: Warm, sunny, 70s
Remedy Includes: (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input checked="" type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>Gas collection and flare system</u> </div> <div style="width: 50%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Unavailable</u> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 40%;">Name</div> <div style="width: 30%;">Title</div> <div style="width: 30%;">Date</div> </div> <div style="margin-top: 5px;"> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="margin-top: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	
2. O&M staff <u>Unavailable</u> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 40%;">Name</div> <div style="width: 30%;">Title</div> <div style="width: 30%;">Date</div> </div> <div style="margin-top: 5px;"> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="margin-top: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Rhode Island Department of Environmental Management

Contact Shelley DuCharme

Name

Title

Date Phone no.

Problems; suggestions; ☐ Report attached

Agency _____

Contact _____

Name

Title

Date Phone no.

Problems; suggestions; ☐ Report attached

Agency _____

Contact _____

Name

Title

Date Phone no.

Problems; suggestions; ☐ Report attached

Agency _____

Contact _____

Name

Title

Date Phone no.

Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> Maintenance logs <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A Remarks <u>The O&M manual was reviewed in the office prior to the Site inspection.</u>			
2.	Site-Specific Health and Safety Plan <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Contingency plan/emergency response plan <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks <u>The hospital route map was posted in the blower building.</u>			
3.	O&M and OSHA Training Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks <u>Not available for review.</u>			
4.	Permits and Service Agreements <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Other permits _____ <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks _____			
5.	Gas Generation Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks <u>Not available for review.</u>			
6.	Settlement Monument Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks <u>Not available for review.</u>			
7.	Groundwater Monitoring Records <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks <u>Copies were provided for review in the office prior to site inspection.</u>			
8.	Leachate Extraction Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A Remarks _____			
9.	Discharge Compliance Records <input type="checkbox"/> Air <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Water (effluent) <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> N/A Remarks _____			

10.	Daily Access/Security Logs	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A																																																		
Remarks <u>Guests signed in and out at the beginning and end of the work day.</u>																																																						
IV. O&M COSTS																																																						
1.	O&M Organization <input type="checkbox"/> State in-house <input type="checkbox"/> Contractor for State <input type="checkbox"/> PRP in-house <input checked="" type="checkbox"/> Contractor for PRP <input type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____																																																					
2.	O&M Cost Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%; text-align: center;">Total cost</td> <td style="width: 30%; text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: center;">Total cost</td> <td style="text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td></td> <td></td> <td></td> </tr> </table>				From _____	To _____		Total cost	<input type="checkbox"/> Breakdown attached	Date	Date				From _____	To _____		Total cost	<input type="checkbox"/> Breakdown attached	Date	Date				From _____	To _____		Total cost	<input type="checkbox"/> Breakdown attached	Date	Date				From _____	To _____		Total cost	<input type="checkbox"/> Breakdown attached	Date	Date				From _____	To _____		Total cost	<input type="checkbox"/> Breakdown attached	Date	Date			
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____ _____ _____																																																					
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A																																																						
A. Fencing																																																						
1.	Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks <u>One small area of fence damage was noted during the November 2008 oversight and again during the Site inspection.</u>																																																					
B. Other Access Restrictions																																																						

1.	Signs and other security measures	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
Remarks <u>Warning signs are in place along the perimeter fence.</u>			

C. Institutional Controls (ICs)

1.	Implementation and enforcement		
	Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input type="checkbox"/> No
		<input checked="" type="checkbox"/> N/A	
	Type of monitoring (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date
			Phone no.
	Reporting is up-to-date	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Reports are verified by the lead agency	<input type="checkbox"/> Yes	<input type="checkbox"/> No
		<input checked="" type="checkbox"/> N/A	
	Specific requirements in deed or decision documents have been met	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	Violations have been reported	<input type="checkbox"/> Yes	<input type="checkbox"/> No
		<input checked="" type="checkbox"/> N/A	
	Other problems or suggestions: <input type="checkbox"/> Report attached		

2.	Adequacy	<input type="checkbox"/> ICs are adequate	<input type="checkbox"/> ICs are inadequate
			<input checked="" type="checkbox"/> N/A
	Remarks _____		

D. General

1.	Vandalism/trespassing	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No vandalism evident
Remarks _____			

2.	Land use changes on site	<input checked="" type="checkbox"/> N/A	
Remarks _____			

3.	Land use changes off site	<input checked="" type="checkbox"/> N/A	
Remarks _____			

VI. GENERAL SITE CONDITIONS

A. Roads	<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
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1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Roads adequate	<input type="checkbox"/> N/A
Remarks _____				

B. Other Site Conditions				
Remarks _____ _____ _____				
VII. LANDFILL COVERS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A				
A. Landfill Surface				
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks <u>No major settlements noted.</u>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Settlement not evident	
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident	
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident	
4.	Holes Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident	
5.	Vegetative Cover <input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input checked="" type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks <u>The landfill cap is mowed annually. It was mowed last October.</u>			
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____			
7.	Bulges Areal extent _____ Height _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Bulges not evident	

8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____ _____	<input checked="" type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____
9.	Slope Instability <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____ _____	
B. Benches <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
C. Letdown Channels <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of settlement
2.	Material Degradation Material type _____ Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of degradation
3.	Erosion Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of erosion

4.	Undercutting Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of undercutting	
5.	Obstructions Type _____ <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____	<input checked="" type="checkbox"/> No obstructions	
6.	Excessive Vegetative Growth Type _____ <input checked="" type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____		
D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Gas Vents <input type="checkbox"/> Active <input checked="" type="checkbox"/> Passive <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
2.	Gas Monitoring Probes <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____		
3.	Monitoring Wells (within surface area of landfill) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks <u>All monitoring wells are located around the perimeter of the landfill.</u>		
4.	Leachate Extraction Wells <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____		
5.	Settlement Monuments <input checked="" type="checkbox"/> Located <input checked="" type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A Remarks _____		

E. Gas Collection and Treatment <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Gas Treatment Facilities <input checked="" type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks <u>4 candlestick flares are currently operating. The active flare system was not operating on the day of the Site inspection.</u>	
2.	Gas Collection Wells, Manifolds and Piping <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks <u>Maintenance was recently performed on piping to prevent and repair damage from the sun and the weather.</u>	
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____	
F. Cover Drainage Layer <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Outlet Pipes Inspected <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____	
2.	Outlet Rock Inspected <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____	
G. Detention/Sedimentation Ponds <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Siltation Areal extent _____ Depth _____ <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Siltation not evident Remarks _____	
2.	Erosion Areal extent _____ Depth _____ <input checked="" type="checkbox"/> Erosion not evident Remarks _____	
3.	Outlet Works <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____	
4.	Dam <input type="checkbox"/> Functioning <input checked="" type="checkbox"/> N/A Remarks _____	

H. Retaining Walls		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Deformations Horizontal displacement _____ Vertical displacement _____ Rotational displacement _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
2.	Degradation Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation Areal extent _____ Depth _____ Remarks <u>Iron fouling observed in the perimeter ditches and the wetlands.</u>	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Siltation not evident
2.	Vegetative Growth <input checked="" type="checkbox"/> Vegetation does not impede flow Areal extent _____ Type _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	Discharge Structure Remarks _____	<input checked="" type="checkbox"/> Functioning	<input type="checkbox"/> N/A
VIII. VERTICAL BARRIER WALLS		<input checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Settlement Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Settlement not evident
2.	Performance Monitoring Type of monitoring _____ <input checked="" type="checkbox"/> Performance not monitored Frequency _____ <input type="checkbox"/> Evidence of breaching Head differential _____ Remarks _____		

C. Treatment System <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A		
1.	Treatment Train (Check components that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Filters _____ </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Others _____ </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Sampling ports properly marked and functional </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Sampling/maintenance log displayed and up to date </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Equipment properly identified </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Quantity of groundwater treated annually _____ </div> <div style="margin-top: 5px;"> <input type="checkbox"/> Quantity of surface water treated annually _____ </div> <div style="margin-top: 5px;"> Remarks _____ </div>	
2.	Electrical Enclosures and Panels (properly rated and functional) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance </div> <div style="margin-top: 5px;"> Remarks _____ </div>	
3.	Tanks, Vaults, Storage Vessels <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance </div> <div style="margin-top: 5px;"> Remarks <u>There is one 2,500-gallon UST located in front of the blower building.</u> </div>	
4.	Discharge Structure and Appurtenances <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance </div> <div style="margin-top: 5px;"> Remarks _____ </div>	
5.	Treatment Building(s) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair </div> <div style="margin-top: 5px;"> <input checked="" type="checkbox"/> Chemicals and equipment properly stored </div> <div style="margin-top: 5px;"> Remarks _____ </div>	
6.	Monitoring Wells (pump and treatment remedy) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A </div> <div style="margin-top: 5px;"> Remarks _____ </div>	
D. Monitoring Data		
1.	Monitoring Data <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input checked="" type="checkbox"/> Is routinely submitted on time <input type="checkbox"/> Is of acceptable quality </div>	
2.	Monitoring data suggests: <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <input type="checkbox"/> Groundwater plume is effectively contained <input checked="" type="checkbox"/> Contaminant concentrations are declining </div>	

D. Monitored Natural Attenuation	
1.	Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A Remarks _____ _____
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <u>Four candlestick flares are currently operating. The active flare system is inactive. The compressor in the blower building is running the three condensate sumps, and the pump in the manhole near the blower building. The condensate is being pumped and stored in the 2,500 gallon UST.</u> _____ _____ _____ _____	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The Site appears to be well-maintained. No evidence of trespassing or vandalism was observed. The landfill cover is mowed annually, and appears to be properly Maintained.</u> _____ _____ _____	
C. Early Indicators of Potential Remedy Problems	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. _____ _____ _____ _____	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. _____ _____ _____ _____	

ATTACHMENT 5
PHOTOGRAPHS DOCUMENTING SITE CONDITIONS

Photo Number 1 – View of Gas Well # 8.

Date: April 29, 2009



Photo Number 2 – View of Gas Well #4 and above-ground manifolding.

Date: April 29, 2009



Photo Number 3 – View of condensate sump #1.

Date: April 29, 2009



Photo Number 4 – View of expansion joint added to the manifolding between gas wells. Date: April 29, 2009



Photo Number 5 – View of perimeter channel outlet.

Date: April 29, 2009



Photo Number 6 – View of detention basin near entrance to perimeter road.

Date: April 29, 2009



Photo Number 7 – View of Perimeter Channel No. 2A.

Date: April 29, 2009



Photo Number 8 – View of the Blower Building and Enclosed Flare (inactive).

Date: April 29, 2009

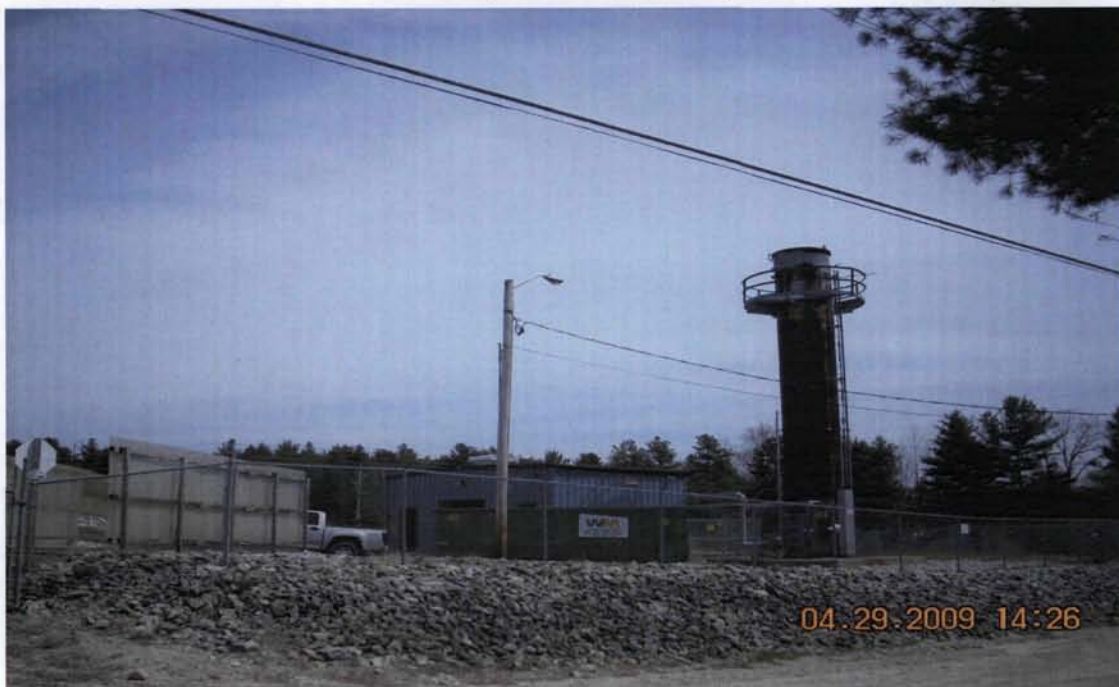


Photo Number 9 – View of manholes to UST used to store condensate.

Date: April 29, 2009



Photo Number 10 – View of gas probe installed in November 2008.

Date: April 29, 2009



Photo Number 11 – View of Gas Probe #5 facing north.

Date: April 29, 2009



Photo Number 12 – View of the southern side of the landfill.

Date: April 29, 2009

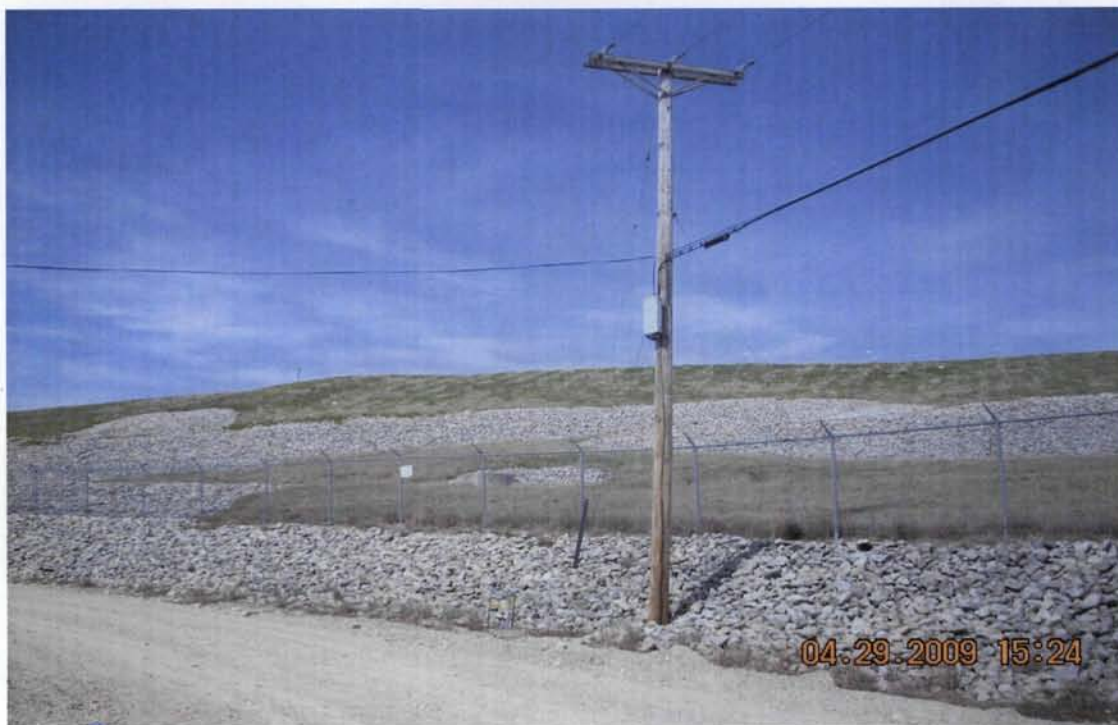


Photo Number 13 – View of damaged perimeter fence.

Date: April 29, 2009



Photo Number 14 – View of monitoring wells CW-7A and CW-7C.

Date: April 29, 2009



Photo Number 15 – View of one of four candlestick flares on top of the landfill. Date: April 29, 2009



ATTACHMENT 6
PUBLIC NOTICE RECORD

EPA Starts Five-Year Review of Landfill and Resource Recovery, Inc. Superfund Site

The U.S. Environmental Protection Agency (EPA) has begun its Third Five-Year Review of the Landfill and Resource Recovery, Inc. (L&RR) Superfund Site, North Smithfield, RI. Five-Year Reviews are required by law and occur every five years. The reviews determine if the cleanup is protective of human health and the environment. This Five-Year Review will be completed by September 2009 and the results will be publicly available.

The Superfund Site cleanup plan included closing the landfill, installing a cover, stabilizing steep side slopes, destroying underlying gases, and building a fence to limit access to the site have reduced the potential for exposure to hazardous materials at the site. In the summer of 1995 the parties potentially responsible for the contamination completed design and construction of all remedies. Long-term operation and maintenance activities are currently underway and will continue until cleanup goal are met.

Contaminants at the site included volatile organic compounds (VOCs) in the air, including carbon tetrachloride, chloroform, and benzene. The groundwater is contaminated with arsenic, lead and VOCs and site surface water is contaminated with lead. The implemented remedy minimized all threats of contamination.

More information about the cleanup can be found on-line at www.epa.gov/ne/superfund/sites/l&rr or at the Municipal Annex Building, 85 Smithfield Road, North Smithfield, RI 02895.



United States
Environmental Protection
Agency New England

Anna Krasko Toll Free 1-888-372-7341, ext. 81232
krasko.anna@epa.gov
www.epa.gov/ne/superfund/sites/l&rr



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— Rosemarie Kouyate, Woonsocket

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ATTACHMENT 7

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Table XII-1
LOCATION-SPECIFIC ARARS
L&RR SITE

SITE FEATURES	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	APPLICATION FOR THE RI/FS
<u>Landfill</u>				
Federal Regulatory Requirements	RCRA - Standards for Owners and Operators of Permitted Hazardous Waste Facilities 40 CFR 264.13-.16	Relevant and Appropriate	General facility requirements outline waste analysis, security measures, and training requirements.	Because RCRA-listed hazardous wastes were placed before 1980, RCRA Subtitle C requirements are relevant and appropriate.
	RCRA - Preparedness and Prevention (40 CFR 264.30 - 264.37)	Relevant and Appropriate	This regulation outlines safety equipment and spill-control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated so that the possibility of an unplanned release threatening human health or the environment could be minimized.	RCRA requirements were considered when evaluating the effectiveness of the present landfill, and will be further considered when evaluating the design of potential alternatives.
	RCRA - Contingency Plan and Emergency Procedures (40 CFR 264.50 - 264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions and fires. This regulation also requires that threats to public health and the environment be minimized.	RCRA requirements were considered when evaluating the effectiveness of the present landfill, and will be further considered when evaluating the design of potential alternatives.
	RCRA - Groundwater Protection 40 CFR 264.98	Relevant and Appropriate	Under this regulation, groundwater monitoring program requirements are outlined.	Groundwater monitoring must be considered for each alternative. During alternatives analysis, the location and depth of monitoring wells will be evaluated for use in this monitoring program.
	RCRA - Closure and Post-closure (40 CFR 264.110 - 264.120)	Relevant and Appropriate	This requirement details the specific requirements for closure and post-closure of hazardous waste facilities.	Long-term monitoring and maintenance portions of the regulation will be considered during remedial design.

Table XII-1
Location-Specific ARARS

Table XII-1 - continued
LOCATION-SPECIFIC ARARs
L&RR SITE

SITE FEATURES	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	APPLICATION FOR THE RI/FS
Federal Regulatory Requirements (continued)	RCRA - Landfills (40 CFR 264.300 - 24.339)	Relevant and Appropriate	Covers design and operating requirements, as well as post-closure care options for landfills. Closure and post-closure care must be attained in accordance with the outlined disposal requirements.	The landfill cover must comply with requirements for disposal closure. Performance evaluation of existing cover has been completed and any potential remedial alternatives must address areas of non-compliance to attain disposal closure.
	Fish and Wildlife Coordination Act (16 U.S.C. 661)	Applicable	This regulation requires any federal agency proposing to modify a body of water to consult with the U.S. Fish and Wildlife Services. This requirement is addressed under CWA Section 404.	During the identification, screening, and evaluation of alternatives, the effects on wetlands will be evaluated. If an alternative would modify a body of water, U.S. Fish and Wildlife Services will be consulted.
State Regulatory Requirements	Rhode Island Rules for Solid Waste Management Facilities (RIGL 23 - 18.9)	Applicable	Outlines regulations for sanitary landfills. Includes initial investigation, site groundwater, operating and closure plans. Closure requirements include 24 inches of cover material to be maintained on all surfaces and faces of the landfill.	Potential remedial alternatives must address areas of landfill cover that do not meet 24-inch requirement, as well as any other areas of noncompliance.
	Rhode Island Hazardous Waste Rules and Regulations (RIGL 23 - 18.9)	Relevant and Appropriate	These requirements correspond to RCRA hazardous waste regulations. Compliance with RCRA will generally achieve compliance with these regulations.	Where RCRA regulations have jurisdiction, these requirements will generally correspond and be attained if more stringent than RCRA.
<u>Wetlands, Trout Brook</u>				
Federal Regulatory Requirements	Clean Water Act (CWA) - 40 CFR Section 404	Applicable	Regulates discharges of dredged or fill material into U.S. waters.	Protection of the adjacent wetland. Applies to sedimentation caused by erosion of 1/2 fill cap fill material.
State Regulatory Requirements	Rhode Island Freshwater Wetlands Law-Rhode Island General Law (RIGL) - Title 2 Chapter 1 (2-1)	Applicable	Regulates and preserves swamps, marshes, and wetlands. Includes maintaining capacity to support wildlife and act as buffer zone for flood conditions.	Considerations such as reducing sedimentation to maintain the adjacent wetland's water storage capabilities will be addressed for the RI/FS.
	Rhode Island Water Quality Regulations (RIGL 46-12, 42-17.1, 42-35)	Applicable	Regulates restoration, enhancement, and preservation of state waters.	Potential remedial alternatives must address this regulation because the adjacent wetland is a state water.

Table XII-1 - continued
LOCATION SPECIFIC ARARS
L&RR SITE

SITE FEATURES	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	APPLICATION FOR THE RI/FS
State Regulatory Requirements (continued)	Rhode Island Water Quality Standards (RIGL 46-12)	Applicable	Water quality standards to be maintained in state waters. Generally, a chemical-specific ARAR, but applicable since it provides physical criteria, such as Best Management Practices (BMPs), to control sedimentation.	During identification, screening, and evaluation of alternatives, BMPs will be considered to control sedimentation to the wetland caused by erosion of the landfill cover material.
Federal Criteria, Guidance, Advisories to be Considered	Wetlands Executive Order (EO 11990)	To be Considered	Prohibits the undertaking of new construction in wetlands.	This regulation will be considered during the RI/FS for use in planning remedial actions.
	EPA Guidance - "Covers for Uncontrolled Hazardous Waste Sites" (EPA/540/2-85/002)	To be Considered	Outlines the three components that offer detailed guidance for the design of a cover system which will achieve the specified performance standards of RCRA landfill covers.	These design guidance criteria were used for the preliminary cover assessment as a baseline for determining the compliance of the existing cover with RCRA requirements. These criteria will also be considered during alternative development and evaluation.

Table XII-2
CHEMICAL-SPECIFIC ARARS AND CRITERIA, ADVISORIES, AND GUIDANCE
L&RR SITE

Requirement Type	Requirement	Requirement Synopsis	Consideration in the RI/FS
Regulatory Requirements	SDWA - Maximum Contaminant Levels (MCLs) (40 CFR 141.11 - 141.16)	MCLs have been promulgated for a number of organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	When the risks to human health due to consumption of groundwater were assessed, contaminant concentrations were compared to their MCLs. Only iron and manganese exceeded their secondary levels. Secondary standards are not health-based; therefore, iron and manganese are not considered contaminants of concern.
Health Criteria, Advisories, and Guidance	Federal Ambient Water Quality Criteria (AWQC)	Federal AWQC are health-based criteria that have been developed for 95 carcinogenic and noncarcinogenic compounds.	AWQC were considered in characterizing risks to human health and aquatic organisms due to contaminant concentrations in the wetlands and Trout Brook. Because this water is not used as a drinking water source, the criteria developed for aquatic organisms were used,
	Health Advisories (EPA Office of Drinking Water)	Health advisories are estimates of risk due to consumption of contaminated drinking water; they consider noncarcinogenic effects only.	Health advisories were considered for contaminants in groundwater that may be used for drinking water.
	EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed by EPA for noncarcinogenic effects.	EPA RfDs were used to characterize risks due to exposure to groundwater contaminants. They were considered for noncarcinogens including 2-butanone and lead.
	EPA Carcinogen Assessment Group Potency Factors	Potency factors are developed by EPA from Health Effects Assessments or evaluation by the carcinogen assessment group.	EPA carcinogenic potency factors were used to compute the individual incremental cancer risk resulting from exposure to arsenic.

Table XII-2 - continued
CHEMICAL-SPECIFIC ARARs AND CRITERIA, ADVISORIES, AND GUIDANCE
LEHR SITE

Requirement Type	Requirement	Requirement Synopsis	Consideration in the RI/FS
	Acceptable Intake - Chronic (AIC) and Subchronic (AIS) - EPA Health Assessment Documents	AIC and AIS values are developed from RfDs and HEAs for noncarcinogenic compounds.	AIS and AIC values were used to characterize the risks due to several noncarcinogens in groundwater and surface water. These noncarcinogens include 2-butanone, trans-1,2-dichloroethene, 1,1-dichloroethane, lead, and zinc.
Rhode Island Criteria, Advisories, Guidance	Rhode Island Water Quality Standards (RIGL 46-12)	Freshwater guidelines were developed for several organics and inorganics.	Water quality standards were compared to AWQCs for compounds such as toluene and arsenic.
	Rhode Island Air Toxics Regulation	Emissions standards developed for traditional and nontraditional stationary sources including landfill vents.	Air modeling results were compared to these regulations when airborne risks were characterized.

Table XII-3
ACTION-SPECIFIC ARARS

LANDFILL AND RESOURCE RECOVERY

REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS
<u>Federal Regulatory Requirements</u>		
RCRA - Subpart B: General Facility Standards	Relevant and Appropriate	General facility requirements outline waste analysis, security measures, and training requirements.
RCRA - Subpart C: Preparedness and Prevention (40 CFR 264.30 - 264.37)	Relevant and Appropriate	This regulation outlines safety equipment and spill-control requirements for hazardous waste facilities. Part of the regulation includes a requirement that facilities be designed, maintained, constructed, and operated to minimize the possibility of an unplanned release that could threaten human health or the environment.
RCRA - Subpart D: Contingency Plan and Emergency Procedures (40 CFR 264.50 - 264.56)	Relevant and Appropriate	This regulation outlines the requirements for emergency procedures to be used following explosions and fires. This regulation also requires that threats to public health and the environment be minimized.
RCRA - Subpart F: Releases From Solid Waste Management Units	Relevant and Appropriate	Under this regulation, groundwater monitoring program requirements are outlined.
RCRA - Subpart G: Closure and Post-Closure (40 CFR 264.110 - 264.120)	Relevant and Appropriate	This requirement details the specific requirements for closure and post-closure of hazardous waste facilities.

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ole XII-3 - continued
ACTION-SPECIFIC ARARS

LANDFILL AND RESOURCE RECOVERY

REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS
<u>Federal Regulatory Requirements</u> (continued)		
RCRA - Subpart N: Landfills (40 CFR 264.300 - 264.339)	Relevant and Appropriate	Covers design and operating requirements, as well as post-closure care options for landfills. Closure and post-closure care must be attained in accordance with either the outlined disposal requirements or by the site-specific alternate method.
RCRA - Subpart O: Incinerators (40 CFR 264.340 - 264.599)	Relevant and Appropriate	This regulation specifies the performance standards, operating requirements, monitoring, inspection, and closure guidelines of any incinerator burning hazardous waste.
Clean Water Act (CWA) (Section 404)	Applicable	Regulates discharges of dredged or fill material into U.S. waters.
Clean Air Act - National Air Quality Standards for Total Suspended Particulates (40 CFR 50.6 - 50.7)	Relevant and Appropriate	This regulation specifies maximum primary and secondary 24-hour concentrations for particulate matter.
OSHA - General Industry Standards (29 CFR 1910)	Applicable	This regulation specifies the 8-hour, time-weighted average concentrations for various organic compounds.
OSHA - Safety and Health Standards for Federal Service Contracts (29 CFR 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.
OSHA - Recordkeeping, Reporting, and Related Regulations (29 CFR 1904)	Applicable	This regulation outlines the record-keeping and reporting requirements for an employer under OSHA.
DOT Rules for the Transportation of Hazardous Materials (49 CFR 107, 171.1 - 171.500)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transport of hazardous materials.
Fish and Wildlife Coordination Act (16 U.S.C. 661)	Applicable	This regulation requires any federal agency that proposes to modify a body of water to consult with the U.S. Fish and Wildlife Services. This requirement is addressed under CWA Section 404.

Table XII-3 - continued
ACTION-SPECIFIC ARARS

LANDFILL AND RESOURCE RECOVERY

REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS
<u>State Regulatory Requirements</u>		
Rhode Island Rules for Solid Waste Management Facilities (November 1, 1982)	Applicable	Outlines regulations for sanitary landfills. Includes initial investigation, site groundwater, and operating and closure plans. Closure requirements include 24 inches of cover material to be maintained on all surfaces and faces of the landfill.
Rhode Island Hazardous Waste Rules and Regulations (June 28, 1984)	Relevant and Appropriate	These requirements correspond to RCRA hazardous waste regulations. Compliance with RCRA will generally achieve compliance with these regulations.
Rhode Island Freshwater Wetlands Law - Rhode Island General Law (RIGL) - Title 2 Chapter 1 (2-1)	Applicable	Regulates and preserves swamps, marshes, and wetlands. Includes maintaining capacity to support wildlife and act as buffer zone for flood conditions.
Rhode Island Water Pollution Control Law (RIGL 46 - 12)	Relevant and Appropriate	These requirements correspond to CWA regulations. Compliance with the relevant sections of CWA will generally achieve compliance with these requirements.
Rhode Island Water Quality Regulations (RIGL 46-12, 42-17.1, 42-35)	Applicable	Restoration, enhancement, and preservation of state waters.
Rhode Island Water Quality Standards (RIGL 46-12)	Applicable	Water quality standards to be maintained in state waters. Generally, a chemical-specific ARAR, but applicable because it provides physical criteria such as Best Management Practices (BMPs) to control sedimentation.
Rhode Island Air Pollution Control Regulations (August 2, 1967)	Relevant and Appropriate	Details the requirements, limitations, and exemptions of state air emission regulations for specified substances.
Rhode Island Air Pollution Control Act (23-23, 23-23.1)	Relevant and Appropriate	Outlines the policy of preserving, protecting, and improving the air resources of Rhode Island.

Table XII-3 - continued

ACTION-SPECIFIC ARARS

LANDFILL AND RESOURCE RECOVERY

REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS
<u>State Regulatory Requirements</u>		
Rhode Island Rules and Regulations Pertaining to the Disposal, Utilization, and Transportation of Wastewater Treatment Facility Sludge. (September 1985)	Applicable	This requirement applies to the disposal of sludge by land application or incorporation of the sludge into the soil for silvicultural purposes.
Rhode Island Air Toxic Regulations (Regulation No. 22)	Applicable	Limits the emission of listed substances from stationary sources.
<u>Federal Criteria, Guidance, Advisories to be Considered</u>		
Wetlands Executive Order (EO 11990)	To be Considered	Prohibits the undertaking of new construction in wetlands, which includes dredging.
EPA Guidance Document - "Covers for Uncontrolled Hazardous Waste Sites" (EPA/540/2-85/002)	To be Considered	Outlines the three components that offer detailed guidance for the design of a cover system which will achieve the specified performance standards of RCRA landfill covers.